ARMED FORCES CHEMICAL JOURNAL

JULY
1952

FOR OXIDANTS...

Consult

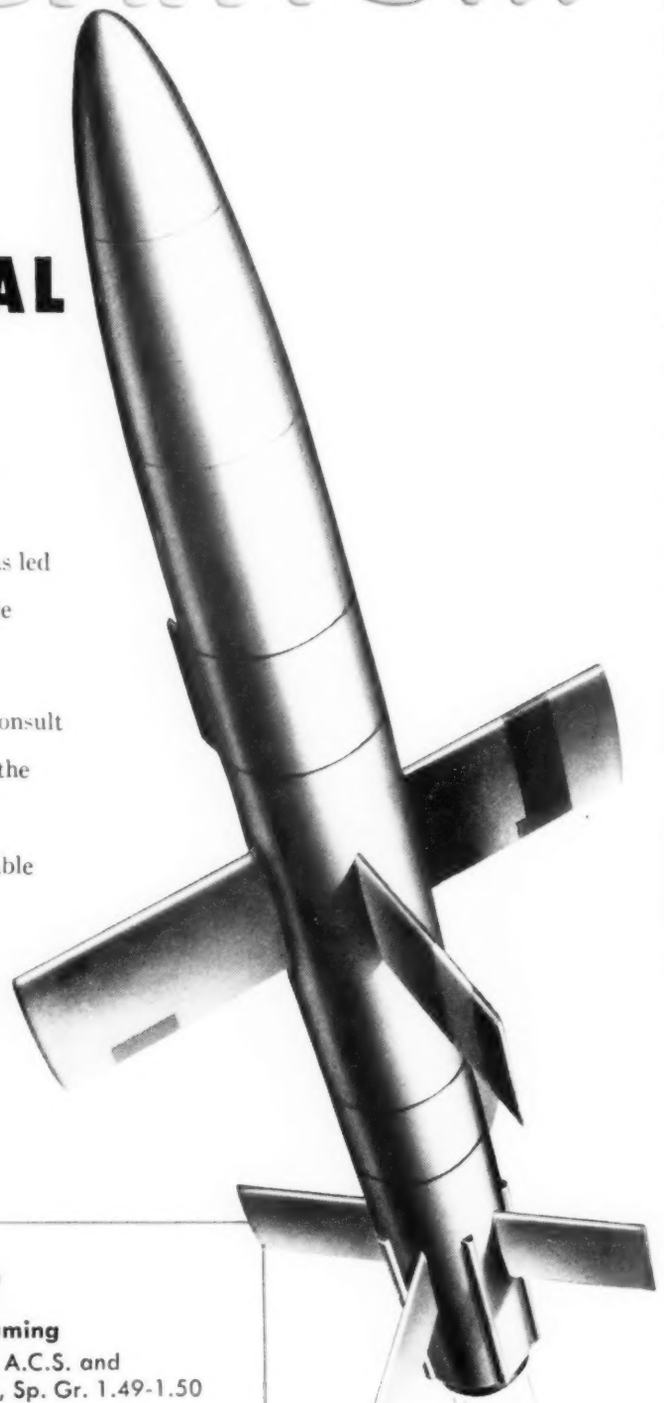
GENERAL CHEMICAL

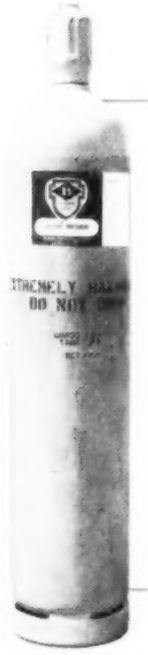
As a primary producer of Nitric Acid for over 50 years General Chemical developed the first Anhydrous Nitric Acid ever made. It also pioneered with special fuming grades. Similarly, its key position in the field of fluorine chemistry has led to its manufacture of Elemental Fluorine, Chlorine Trifluoride and related compounds.

If you require the oxidants listed here or similar materials, consult General Chemical. A letter outlining your needs will receive the prompt, *confidential* attention of our Product Development Department. The services of its technical staff are also available in helping develop special products to your specifications.

Product Development Department

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.





NITRIC ACID

Anhydrous
Total Acidity 99.8% min.

White Fuming
Reagent, A.C.S. and Technical, Sp. Gr. 1.49-1.50

Red Fuming
Reagent, and Technical
Sp. Gr. 1.59-1.60

FLUORINE COMPOUNDS

Elemental Fluorine **Chlorine Trifluoride**

Other Organic Fluorides

BASIC CHEMICALS
FOR AMERICAN INDUSTRY

ARMED FORCES CHEMICAL JOURNAL

OFFICIAL PUBLICATION OF THE ARMED FORCES CHEMICAL ASSOCIATION
SUITE 819, 2025 EYE ST., N.W., WASHINGTON 6, D.C.

VOLUME VI | JULY, 1952 | NO. 1

The Armed Forces Chemical Journal is the official publication of the Armed Forces Chemical Association. The fact that an article appears in its columns does not indicate the approval of the views expressed in it by any group or any individual other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors.

COVER PHOTO

National President
L. W. MUNCHMEYER

INDEX

ADVERTISERS

Published quarterly—January, April, July, October—by the Armed Forces Chemical Association, located at National Headquarters, Armed Forces Chemical Association, Suite 819, 2025 Eye St., N. W., Washington 6, D. C. Entered as second class matter at the Post Office at Washington, D. C., under the Act of March 3, 1879. Additional entry at Nashville, Tenn. Subscription price $2.00 per year to members; $4.00 per year to non-members.

EDITORIAL

Communist propaganda charging that the United States forces in Korea have been using bacteriological warfare need to be very carefully studied. We know the charges are utterly false, and they have been categorically denied.

This particular propaganda campaign has been pursued so persistently that it becomes necessary to determine just exactly what objectives it may have. It has been speculated that the charges have been made for several specific reasons. Some of these may be:

1. To create ill will and antagonism in Asiatic countries against the United Nations in general and the United States in particular.

2. To increase the fears and apprehensions of European peoples by suggesting that a renewal of war will be accompanied by new and "dreaded" means of warfare.

3. To counteract the loss of confidence and bitterness among Communist soldiers in Korea, and the people of North Korea and China, caused by the utter failure of the Communist military forces to control and combat epidemics among their troops and civilian populations. Such epidemics were inevitable under conditions prevailing in the areas in which their troops were concentrated. They could only be controlled by modern scientific methods implemented with such numbers of trained personnel and such quantities of medical materiel as may not be possessed by the Communists in Korea and China. Indeed, it is conceivable that the Communists might view with a good deal of philosophy a substantial reduction in population among the Chinese, on the premise that they could reconstruct a food economy for a reduced population which they would view as practical, and furthering the Communist cause. *Obviously, if they have any such notions of genicide and could carry them out with the United States bearing the burden of guilt, it would be more than satisfactory to them.*

4. Much more speculative is the suggestion that the Communists contemplate initiating the use of bacteriological warfare themselves and are endeavoring to place the onus for such use on the United States, as a measure of retaliation.

The JOURNAL suggests that there may be still another motivation behind the charges. The Communists may be trying to jockey the United States into the position of pledging itself not to use such means of warfare, or tipping its hand on its capability in this direction.

For the United States to make any such commitment would be a fateful mistake.

Everyone knows that the United States is NOT going to start World War III. The nature of our people and of our political structure is such that we simply do not under any circumstances initiate wars.

Thus, if there is to be war, the Communists will have the enormous advantage of deciding WHEN it is to begin. And from this it follows that they will be able to control the crucial circumstances of WHERE it is to begin.

We must not let them jockey us into any position which will give them the further advantage of deciding HOW it is to be fought, and with what weapons.

The United States has thoughtfully, deliberately and for good reason refrained from making any treaty or commitment not to use gas, biological or any other means of warfare. This decision, made in cold deliberation, must not be changed under any heat of emotion or by reason of any skillful maneuvering by our enemies.

The JOURNAL does not with knowledge presently available advocate the use of biological warfare; such an advocacy would imply a much broader knowledge of information, doctrine and policy than the JOURNAL possesses. It DOES strongly advocate that this nation maintain itself completely free to use such means of warfare if and when those charged with our defense deem it wise and expedient.

—HAROLD B. RODIER, *Editor*

MESSAGE FROM THE PRESIDENT

In the last few years our young organization has risen rapidly to meet its responsibilities to the military, industry and the Reserve Officers. It is evident that these responsibilities will be constantly increasing and I am sure that our organization will continue to meet them, both on a national level and a chapter level. AFCA is growing in size and financial responsibility but, I think of more importance, it is growing in supporters who are both able and willing to effectively put their shoulder to the wheel to assure that our progress is both firm and rapid.

Most of our chapters are growing in strength and list some outstanding leaders in their officers, so that I am most confident they will continue their progress and will have some most interesting and worthwhile programs. I am gratified to see one of our newest chapters—the Ft. McClellan Chapter—develop into a most active one.

We certainly have gotten off to an excellent start for our new fiscal year with the Annual Meeting in Chicago. The Chicago Chapter outdid themselves in arranging for a most interesting meeting. The many able speakers gave us much food for thought and an inspiration that should carry us on for some time to come. It was particularly gratifying to see the Armed Forces representatives and the AFCA representatives working so closely together on our mutual problems.

I welcome Mr. Hugo Reimer and Dr. Ralph Gibson as new members to the Executive Committee and am particularly glad to announce that one of our past Presidents, Colonel Harry A. Kuhn, has agreed to act as Special Advisor to me. Dr. Lawson as Immediate Past President, of course, will be active on this Committee. I am confident that the Executive Committee can be of real help to the various chapters and the individuals. We will welcome requests for assistance and your suggestions.

—L. W. MUNCHMEYER

DIRECTORS-AT-LARGE
ARMED FORCES CHEMICAL ASSOCIATION

1952-1953

DR. M. H. BIGELOW
Libby-Owens-Ford Co.

DR. RALPH CONNOR
Rohm & Haas Co.

LELAND I. DOAN
Dow Chemical Co.

DR. P. K. FROLICH
Merck and Company

COL. L. WILSON GREENE
Army Chemical Center

DR. WILLIAM J. HARSHAW
Harshaw Chemical Company

R. W. HOOKER
Hooker Electrochemical Company

T. G. HUGHES
Oronite Chemical Co.

DR. H. F. JOHNSTONE
University of Illinois

DR. DONALD B. KEYES
National Association of Manufacturers

COL. LUDLOW KING
Owens-Corning Fiberglas Co.

SIDNEY D. KIRKPATRICK
Chemical Engineering

COL. HARRY A. KUHN
Consultant

H. B. McCLURE
Union Carbide & Carbon Corporation

E. V. MURPHREE
Standard Oil Development Co.

DR. WALTER J. MURPHY
Industrial & Engineering Chemistry

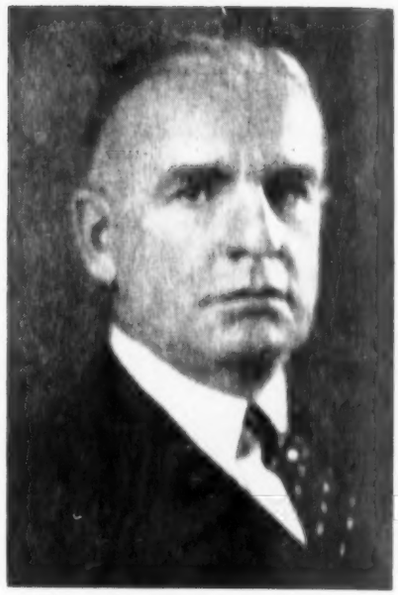
DR. ALBERT W. NOYES
University of Rochester

RALPH M. PARSONS
The Ralph M. Parsons Co.

DR. M. E. SPAGHT
President
Shell Development Co.

DR. E. H. VOLWILER
Abbott Laboratories

THE 7th ANNUAL MEETING OF THE AFCA AT CHICAGO, ILLINOIS



GEORGE B. DRYDEN
Voted an Honorary Life Member

The officers and committees of the Chicago chapter are to be congratulated upon the highly successful Annual Meeting of the Armed Forces Chemical Association held in Chicago May 15-17. With an attendance of nearly 500, the meeting was well organized and skillfully conducted. The speeches were of exceptional interest and the questions freely presented to the speakers at the end of the Friday morning symposium and the Friday afternoon session were pointed and well answered.

Smooth "stage management" marked every phase of the Annual Meeting from the beginning of registration on Thursday until the last goodbyes were said following the featured trips on Saturday.

There follows a brief resume of the business sessions. The various talks given are separately reported.

DIRECTORS' MEETING

The Board of Directors met at 11 o'clock at the Hotel Sherman, in Chicago, with President Walter E. Lawson presiding.

On motion of Col. Harry A. Kuhn, unanimously passed, the Board of Directors voted an Honorary Life Membership to Mr. George B. Dryden, for his distinguished services to the

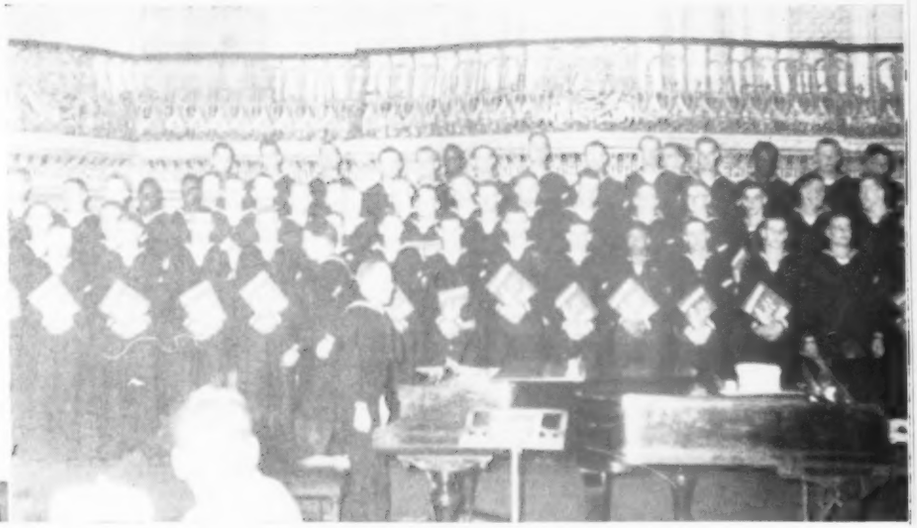
Our new President, Colonel L. W. Munchmeyer, CmlC Res., is Assistant General Manager of Ansco, a Division of General Aniline & Film. His home is in Binghampton, N. Y. During World War II, Col. Munchmeyer served on the Army-Navy Munitions Board and in the office of the Chief Chemical Officer. Later he was in charge of operations at the Huntsville Arsenal, Huntsville, Ala. He was awarded the Legion of Merit for his services during the war years. Col. Munchmeyer is a member of the American Institute of Chemical Engineers and the American Chemical Society. He has been First Vice President of the Armed Forces Chemical Association for the past two years.

NEW FACES IN THE EXECUTIVE COMMITTEE

Mr. Hugo Riemer, Fourth Vice President, Chairman, Publications Committee. (President, Nitrogen Division, Allied Chemical & Dye Corp., New York, N.Y.)

Dr. Ralph E. Gibson, Sixth Vice President, Chairman, Research and Development Committee. (Director, Applied Physics Laboratory, Johns Hopkins University, Silver Spring, Md.)

Rear Admiral Calvin M. Boister, Chief, Office of Naval Research, addressed the afternoon session.



The Bluejacket Choir from the Great Lakes Naval Training Station gave a concert during the banquet.

Chemical Warfare Service and the Chemical Corps, over a period of many years, and for his magnificent support of the Association.

The Board then received the report of the Nominations Committee from its Chairman, Mr. Hilton Smith. The following officers were elected:

President, Colonel L. W. Munchmeyer, USAR, Binghampton, N. Y.

First Vice President, Rear Adm. Nathaniel S. Prime, USN (Ret.), Frederick, Md.

Second Vice President (Chairman of Finance Committee), Colonel Robert T. Norman, USAR, Washington, D. C.

Third Vice President, (Chairman of Membership and Organization), Lt. Col. E. E. Frederick, USAR, Chicago, Ill.

Fourth Vice President, (Chairman of Publications), Mr. Hugo Riemer, New York, N. Y.

Fifth Vice President, (Chairman of Meetings and Conventions), Mr. Howard S. McQuaid, Wilmington, Del.

Sixth Vice President, (Chairman of Research and Development), Dr. Ralph E. Gibson, Silver Spring, Md.

Seventh Vice President, (Chairman, War Mobilization Planning), Colonel E. R. Baker, Ponca City, Okla.

After the election of officers the Board of Directors adjourned, and the newly elected Executive Committee convened to elect the following officers:

Secretary-Treasurer, Mr. Fred M. Jacobs, Washington, D. C.

Assistant Treasurer, Mrs. Miriam Rappoport, Washington, D. C.

General Counsel, Major Charles E. Pledger, Jr., USAR, Washington, D. C.

Editor, Lt. Col. Harold B. Rodier, CmlC (Ret.), Washington, D. C.

Col. Rodier announced the appointment, with the approval of the Executive Committee, of the following:

Associate Editor, (Technical Advisor), Col. L. Wilson Greene, USAR, Army Chemical Center, Md.

Associate Editor, (Advisor on Reserve Officer Affairs), Major John E. Carroll, USAR, New York, N. Y.

ANNUAL MEETING

The business session of the 7th Annual Meeting convened at 2:15 p.m., President Walter E. Lawson presiding. He reported to the membership the results of the election of officers by the Board of Directors, and also the result of the election, by mail ballot of the entire membership, of the Directors-at-Large.

DIRECTORS-AT-LARGE

Following is listed the new Directors-at-Large: (These Directors, with their affiliations, are pictured elsewhere in this issue.)

Dr. Maurice H. Bigelow, Dr. Ralph Connor, Mr. Leland I. Doan, Dr. Per K. Frolich, Col. L. Wilson Greene, Dr. William J. Harshaw, Mr. R. W. Hooker, Mr. T. G. Hughes, Dr. H. F. Johnstone, Dr. Donald B. Keyes, Mr. Sidney B. Kirkpatrick, Col. Ludlow King, Col. Harry A. Kuhn, Mr. H. B. McClure, Mr. E. V. Murphree, Dr. Walter J. Murphy, Dr. Albert W. Noyes, Mr. Ralph M. Parsons, Dr. M. E. Spaght, and Dr. E. H. Volwiler.

SECRETARY-TREASURER'S REPORT

President Lawson then called for reports of officers and standing committees. The report of the Secretary-Treasurer having been printed and distributed to those present, President Lawson invited attention to the generally satisfactory nature of the membership increase and financial situation, but warned that the tense world situation has laid new obligations upon the AFCA which call for increased efforts in improving our membership and our financial position if we are to maintain our capacity to fully meet the demands made upon the Association. He expressed his regret that the Secretary-Treasurer, Fred M. Jacobs, had been unable to make the trip because of ill health; and extended to Mr. Jacobs, on behalf of the Association, his warm thanks for the splendid job he is doing for AFCA.

AFCA AWARDS

President-Elect L. W. Munchmeyer reported upon awards of medals by the AFCA to outstanding men in R.O.T.C. units of the Army, Navy and Air Force. He advised that 19 such awards had been made, and stressed the constantly increasing interest which these awards have developed. He recommended the continuation of this program. The names and pictures of the recipients of these awards appear elsewhere in the JOURNAL.

MEMBERSHIP

Vice President E. E. Frederick reported that the Association continues to grow in membership, but expressed his conviction that a little effort by interested members would accelerate this growth and urged that this effort be made.

A JOURNAL FORUM

In the absence of Vice President Baldwin, Col. Rodier reported for the Publications Committee. He urged that our membership make use of the JOURNAL as a forum in which they might express their ideas. He promised that letters on subjects of general interest would be published, if sent in to

The President's Reception was well attended. Mrs. Viola Lounsberg and Mrs. Mabel Shay in the forground.

The Ladies' Program was a Big Success.

the editor, and expressed the belief that such a medium for the exchange of ideas would prove interesting and stimulating to our readers.

MEETINGS

Vice President Howard McQuaid reported on the Annual and mid-years meetings, and complimented the Chicago Chapter upon the excellence of their arrangements for this meeting. He called attention to the fact that the decision as to where the next Annual Meeting would be held would probably be made at the September mid-year meeting. He urged that any suggestions with respect to this be sent in to the national headquarters in time to be considered at this meeting.

THE RESERVE OFFICER

Vice President Prime had no report for the R. & D. Committee, but reported on a special committee with respect to publication of news of interest to Reserve Officers in the JOURNAL and *News*. He urged that such features be carried and recommended that the Editor be assisted in this feature by the appointment of an additional Associate Editor, a Reserve Officer, to advised on such material. (The appointment to this post of Major John E. Carroll has been reported elsewhere.)

Admiral Prime then paid tribute to the Reserve Officer in a brief but stirring talk. In part, Admiral Prime said, ". . . I say this in regard to the Reserve Officer, in a pinch he is as good as any Regular. He will serve to the maximum of his capacity, not only to save his own life, but because he is devoted to his job. He is utterly devoted to his job. He is devoted to his job more than the Regular Officer is, and I say that believing, because we Regulars—and I am a Regular, retired or not it does not affect my Regular status—have a strong tendency to consider ourselves and our careers in all we do with respect to the Service. The Reserve Officer has no Service Career to worry about; he has only his neck and his position with respect to his command.

"I say, the Reserve Officer needs a welcome by the Regulars, by everybody, all people who are concerned with the Department of Defense. I say that he needs recognition; he needs to understand that he is needed in order to fight our battles. I say that there is a very great need, in the control of Reserve Officers and enlisted men, to fit the man to the job. He is not broadly trained. He is not capable of taking on any job which we have among the manifold jobs. He has particular training, particular abilities, and we will get the most out of him if we fit him to his abilities.

"The Reserve Officer and enlisted man is the difference between being ready for war on time and being ready for war after you are already licked. Put that away and remember it, because it is as true as anything that was ever said. In our own generation we have fought two wars. We have been lucky, fearfully lucky, because we had time to train adequate forces. You know, as well as I do, we are not going to have that time again. These Reserve Officers must not be alienated. They must be embraced; they must be welcomed; they must be made a part of our defense, so they can serve us when we need them, and they will serve us well and willingly and devotedly when we need them."

GENERAL BULLENE PAYS TRIBUTE TO AFCA

Maj. Gen. Bullene then spoke briefly. In the course of his remarks he said, "This Association has, for my money, really 'batted.' I have been backed up, helped, assisted. It is wonderful, the support I have received. . . . Problems come up and you need help. Those problems did come up and I was helped and this Association did it. . . . For the Chemical Corps, I want to thank you."

"I'M SENDING YOU A BIG BOUQUET OF ROSES"

At this point President Lawson read a wire from George Irving, of Tyler, Texas, former President of the Dallas Chapter. He said, "I have made arrangements to send 40 dozen roses . . . to be used at the banquet."

This beautiful gesture, which Mr. Tyler has made for the last three meetings, was received with applause, and a resolution of thanks was passed with acclaim.

The session adjourned at 4:20 p.m.

INDUSTRY'S PLACE IN THE ARMED FORCES PROGRAM

The meeting convened again on Friday, May 16th, at 10:20 a.m., for a Symposium on the above subject. President Lawson presided, and the speakers were Brig. General Henry M. Black, Commanding General of the Chemical Corps Materiel Command; Brig. General William M. Creasy, Commanding General, Chemical Corps Research and Engineering Command; and Colonel Ragner E. Johnson, Commandant of the Chemical Corps School at Fort McClelland, Alabama, and representing the Chemical Corps Training Command.

The addresses of each of these officers is carried in full in succeeding pages of this JOURNAL.

A question period followed the three talks. Because the questions covered a broad field these questions and answers are carried, not at the close of each address but grouped together in a separate feature.

Preceding the symposium (the word is here used in its more sedate sense) President Lawson called upon Morton Hague, President of the Chicago Chapter, who made an ad-

Rear Admiral Francis P. Old, Commandant Ninth Naval District, gave the address of welcome.

President Lawson congratulates Morton Hague, President of the Chicago Chapter, on a splendid Annual Meeting.

dress of welcome. Space forbids that it be carried here, but we must lift one of Mr. Hague's quotes from the late President Theodore Roosevelt.

> "Every man owes a certain amount of his time to the uplifting of the profession into which he pours his sweat, and out of which he earns his bread."

We consider this an excellent argument for membership in the AFCA, on the part of Chemical Corps officers and professional personnel, and chemical industrialists who have any concern with chemical warfare.

The meeting adjourned at 12:25 p.m.

FINAL SESSION

The final general session of the 7th Annual Meeting convened at 2:15 p.m., Friday, May 16th, with President Lawson presiding.

The first speaker on the afternoon program was General Bullene. His talk is reported in full on subsequent pages.

The next speaker was Rear Admiral Calvin M. Bolster, Chief of the Office of Naval Research. Admiral Bolster's scheduled talk was on "Problems of the Navy." In his introductory remarks he said that he preferred to speak of the Research and Development program of the Navy. He gave a clear and intensely interesting account of the research program of the Navy, and his talk met with a warm response by the audience.

The final speaker on the afternoon program was Gen. Telford Taylor, Admnistrator, Small Defense Plants Administration, who discussed "Small Business and Defense Contracts." His address is reported in full in this issue.

The final general sesson adjourned at 4:20 p.m.

THE PRESIDENT'S RECEPTION AND BANQUET

The President's Reception was held in the Louis XVI and Crystal Rooms of the Hotel Sherman. It was a brilliant and lively affair and set the mood for the banquet which followed.

The banquet setting was beautiful, the tables decorated with Mr. Irving's roses. The Bluejacket Choir from the Great Lakes Naval Training Station supplied a musical background for the evening. These men were truly wonderful and no feature of the meeting arouscd more enthusiasm.

Chaplain Clinton R. Everts, USAF, delivered the invocation at the dinner, and Rear Admiral Francis P. Old, Commandant of the Ninth Naval District, gave the address of welcome. The honor guest, Hon. Dan A. Kimball, Secretary of the Navy, made his address early in the evening, to fit in with the radio broadcast of his talk. Mr. Kimball was presented with an AFCA Scroll honoring his distinguished services in the cause of our National Defense, by President Lawson. Thereafter the other guests were introduced, including Rear Admiral R. A. Saldias, Minister of Marine of Peru, and his staff.

The retiring president, Walter E. Lawson, then formally invested his successor with his office, and President L. W. Munchmeyer made a brief speech, and declared the 7th Annual Meeting adjourned.

THE SATURDAY PROGRAM

Two scheduled events were offered on Saturday, May 17th: a trip to the Museum of Science and Industry, and the University of Chicago atomic energy laboratories, and an afternoon trip to the Great Lakes Naval Training Station where an elaborate Armed Forces Day program was presented.

THE LADIES' PROGRAM

An entertaining series of tours, including a luncheon at Marshall Field's, was offered the ladies. The planning for the ladies by the Chicago Chapter AFCA Ladies' Committee was highly successful and warmly appreciated by the many ladies who attended the meeting.

WILSON GREENE HONORED BY NORTH CAROLINA STATE COLLEGE

L. Wilson Greene, a Director-at-Large of the Association and Associate Editor of the ARMED FORCES CHEMICAL JOURNAL, was awarded the honorary degree of Doctor of Engineering by the North Carolina State College of Agriculture and Engineering at Raleigh, N. C., on June 8. The award was made for Dr. Greene's professional achievements in chemical engineering and in research and development for national defense.

The degree was conferred at the annual Commencement convocation which was held in the William Neal Reynolds Coliseum, following a luncheon given in honor of Dr. and Mrs. Greene by Chancellor J. W. Harrelson and Professor J. H. Lampe, Dean of Engineering.

Dr. Greene graduated from N. C. State College thirty years ago with the degree of Bachelor of Science in Chemical Engineering. He has been connected with the Chemical Corps since 1929 as a chemical engineer and an officer, having served during the last war as a colonel in the CWS. He is now Technical Director of the Chemical and Radiological Laboratories at the Army Chemical Center, and is also a colonel in the Chemical Corps Reserve.

the NEEDS of the ARMY

By
MAJ. GEN. E. F. BULLENE, U.S.A.
Chief Chemical Officer

Speech delivered at annual meeting of the Armed Forces Chemical Association, Chicago, Illinois, May 16, 1952.

If any of you are thinking what I imagine you may be thinking—The answer is "NO."

The Communist propaganda about our use of BW in Korea is ridiculous. I think I can say this authoritatively since my people are charged with the responsibility for this weapon. So much for that.

And now, let me give what might be considered as a "report to the stockholders" in the Chemical Corps. You are not all the stockholders, but you are the most interested ones, as evidenced by your membership in this Association and your presence here today.

Back in 1946, when the Armed Forces Chemical Association was first formed, an objective among others was to keep alive the industrial knowledge as applied to chemical warfare that had been gained through the years of World War II. The founders envisioned a long period of peace, such as after World War I, and had hopes that the Association could do its part in maintaining the "know how" that had been gained in the years 1941 through 1945 in the chemical field. Today, thanks to Joe Stalin, we are back in business. The Chemical Corps and the chemical industry have again joined in a mutual effort—the defense of our freedom. When the time came in 1950 for this renewal of cooperative endeavor, we found that the path was much smoother than it had been back in 1941. We were able to get our limited industrial mobilization underway with a minimum of confusion and delay. Much of the credit for this must go to the AFCA, for it has served both the military and industry well during the past six years.

The record of our host here today, the Chicago Chapter, is indicative of the outstanding work of the Association. That the organization's program of activity is of interest to the members of the chemical industry has certainly been shown within the past year or so. On several occasions more than 500 members and guests of the Chicago Chapter have turned out to hear Chemical Corps speakers during the industrial symposia conducted by our hosts. I feel that is not only a vote of confidence in the Association itself by the members of industry, but also a confidence vote in the Chemical Corps.

The Armed Forces Chemical Association provides a most effective medium through which the needs and problems of the military may be worked out with industry in mutual understanding and to the satisfaction and benefit of all concerned. The value you men of industry place upon this Association is exemplified in your attendance at this Convention. The value the military places upon it is shown in the fact that three generals and a colonel are in attendance as official representatives of the Chemical Corps.

The theme of tomorrow's Armed Forces Day is certainly shown here. "Unity—Strength—Freedom." We have unity of thought—that the Chemical Corps must be second to none. We have strength in that the Chemical industry—which is so well represented here today—is our strongest cog in the nation's industrial machine. And we have freedom, otherwise you would be here today under compulsion rather than by choice, and we have no fear that our thoughts and actions at this meeting will have reprisals.

In years past, the Chief Chemical Officer has outlined the Corps' program at these meetings. This year we have taken a different approach. This morning you heard the three officers responsible for our three main functions—research, procurement, and training. For me to stand here and discuss the tangible work of the Chemical Corps would only be a repetition of the thoughts they left with you.

The program lists my talk as "The Needs of the Army." That is a very broad subject, which I will only partially cover. However, one of the biggest needs of the Army is something that can be expressed as "public understanding." To pinpoint this even further, let's make it a "public understanding of chemical warfare"—or if you wish to broaden the base, "a public understanding of toxic or CBR warfare."

Since our nation has assumed the role of world leadership in the fight for freedom, there are certain international facts of life we must face. One is that we are the prime target for any would-be world power. This is an elementary fact that we all realize.

On the other side of the world there exists a threatening power representing a denial of all these benefits that we take for granted. We must be prepared to meet the threat of an open fight between the free world and the slave world that exists behind the Iron Curtain and the new Bamboo Curtain. As we work to protect ourselves, one question keeps coming up again and again. The answer to the question is hidden behind the inscrutable countenance of one man whose face has become a symbol of totalitarian power.

Because the very nature of democracy, as we now practice it, precludes any war-like action on our part except in retaliation, the choice rests with Joe. As a nation, we have a

reluctance to fight unless attacked, so we must plan accordingly.

Whatever the outcome of the truce talks in Korea, the joint task of industry and our military establishment is far from ended. Korea has taught us that we must, for years to come, be constantly ready successfully to resist aggression from the forces of Communism. We must be ready to meet the threat, whether it comes in the form of local aggression like Korea or an all-out attack on the free world.

Great victories have been won by surprise attacks carried out with boldness and forethought. The unforgivable sin is to be taken by surprise. We of the military would be derelict in our duty if we did not take every possible step to prepare for every eventuality of war which can be foreseen. Among such eventualities is the possible use of toxic agents by a future enemy. We would also be derelict in our mission of upholding freedom and justice if we did nothing to prepare the public to meet this possible threat. In doing this, we must think on defensive terms from an offensive point of view, for the first step taken in preparing any defense is to realize the full capabilities of the threat that is faced.

In all human history, the "ideal" war was probably the war between the Philistines and the Israelites which was decided by individual combat between David and Goliath. In this war, no homes were destroyed, no productive facilities were smashed or ruined, no farmlands were rendered untillable. The victors did not have to support the vanquished when the war was over until their production facilities could be restored. In fact, only one life was lost in the entire war, that of the Philistine champion, Goliath.

In modern war, as it has happened in our time, victory has proven almost as expensive to the winner as defeat to the loser. The economic structure in the modern world is so integrated that no nation can afford to leave another power in permanent bankruptcy.

My purpose here today is to sound an alert to the possibility of a toxic agent attack, because it is both effective and logical.

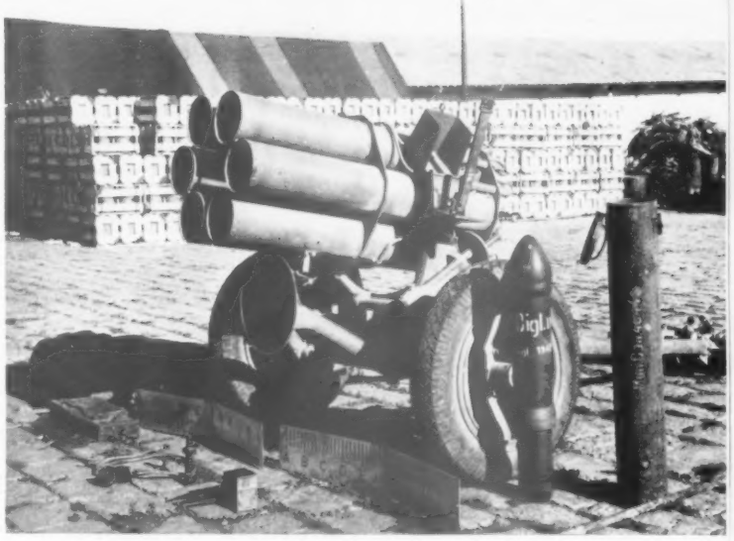
There is a general feeling that in World War I defenses against gas warfare had reached a point where gas was no longer an effective weapon. The thinking is that gas is only a potential nuisance on the field of battle and not a decisive casualty agent.

The fact that gas has not been used by either side in Korea, and wasn't used in World War II, it seems adds weight to that type of thinking. Nothing could be further from the truth. Gas is far from obsolete. In fact, against personnel, it probably has one of the greatest potentials of any weapon in the arsenal of war. The Communists have not failed to use toxic agents against the United Nations' forces because they consider them obsolete. It is just that they do not want to lay themselves open to retaliation from the nation whose chemical industry leads the world. That also was the answer to the question of why gas was not used in World War II, despite the fact that the Nazis and Japanese were stockpiling more than a quarter million tons of chemical agents.

Germany had introduced gas in 1915 in a desperate move. There had been a grave miscalculation, according to a German historian, and there was a critical shortage of high-explosive artillery ammunition. So, at Ypres, they unleashed a chlorine attack which could have provided them with a decisive victory if they had followed up their advantage. The gap it created in the Allies' lines was big enough that the Germans could have forced their way to the English Channel and split the Allied forces. They didn't, and the war lasted for three more long drawn-out years with both sides working feverishly to perfect new toxic agents.

It is true that defensive measures against chemical agents developed in World War I as the agents themselves were developed, but this doesn't mean that chemical agents became less and less effective as their use increased.

It is significant that in the Armies which fought through



—U.S. Signal Corps Photo
A German chemical gun captured near Oran, North Africa, in May, 1943.

the entire four years of the first World War, the proportion of gas casualties to total wounded was in no case greater than seven and one-half percent. In the American Army, where battle casualty figures are available only for the last year of the war, gas casualties were nearly one-third of the total wounded. In other words, as the employment of gas increased, and in spite of the development of defensive measures against it, the casualty-producing potentialities continued to build up. Yet, the records show that a man hit by gas had a 12 times better chance to survive, than did a man wounded by other means.

In 1918, during the closing months of the war, gas ranked first among all the military agents in the production of non-fatal casualties, and second in the production of total casualties. It took about 60 pounds of mustard gas on the average to produce one casualty; approximately 500 pounds of high explosives were expended for each man wounded; and the average was one casualty to 500 rounds of rifle and machine gun fire.

Altogether about ten million artillery shells were filled with mustard gas, and of these approximately nine million were fired. These nine million shells produced 400,000 casualties or one casualty for every 22.5 mustard shells fired. Thus, mustard gas shells proved to be twice as effective as the average gas shell and nearly five times as effective as shrapnel and high explosive shells. Thus, we see that gas can't be considered obsolete because it became ineffective.

There are other factors that have to be considered when we talk about the possibility of gas being used in future wars. Gas, effective though it is against personnel, does nothing like the permanent damage done by high explosives and flying fragments of steel.

Now the United States is the leading industrial nation of the world and our chemical industry is, of all industries, the greatest. To us, this industrial potency and chemical warfare offer tremendous possibilities in meeting the thrust of potential aggressors. And, at the same time, we must not overlook the fact that certain would-be world powers are certainly casting envious eyes at our great productive machine. We have only to look at the industrial rape of East Germany and Manchuria to realize this.

We know that massed bombing with incendiaries or explosives can destroy industrial installations and the accumulated property of generations within a relatively short period of time. But when wars come to an end, the period of reconstruction that follows is long and costly to both victor and vanquished.

—Chemical Corps Photo

An old photo showing students of the Chemical Corps School watching portable gas cylinders in action. It was with similar equipment that the Germans unleashed their first gas attack in 1915.

The principle of strategic bombing is to cripple the industrial power behind a nation's war machine. It is easy to see that repeated bombings with persistent war gases would drastically curtail war production in industrial centers. Workers would have to try to carry on, wearing protective masks and protective clothing. Buildings, plant areas, and materials would be contaminated; and time and manpower-consuming decontamination procedures would have to be followed.

The chemical weapon is an anti-personnel weapon; however, aside from the incendiary-type bomb, it is generally not destructive of materiel. The chemical weapon is cheap, it is effective, and it does not inflict permanent damage to property. It will do things that the destructive weapon cannot do. The destructive weapon is armor piercing. The chemical weapon is armor penetrating. The underground fortification and the bomb-proof shelter, unless protected with intricate and intact air-filtration devices, are equally vulnerable to penetration by the chemical weapon.

In carrying out an actual strategic operation against an enemy industrial center, toxic agents can be used to incapacitate the industrial manpower of any given area. Thus, we must, in the light of present world conditions, prepare for all such eventualities.

Since no gas bombs were dropped from aircraft in the first great war, we have no statistics, as we have for the ground munitions, on which to base our full comparisons on the efficiency of chemical and high explosive bombs. However, we know that the gas bomb, as an anti-personnel weapon, can out-perform the high explosive bomb just as much as the gas shell does over the HE shell on a pound-for-pound basis. Then, too, there is the economy factor that during World War II, a 100-pound general purpose high explosive bomb cost almost a third more than a 100-pound mustard gas bomb. However, although today's prices are almost double the World War II prices, there is still the big difference between the costs of the two types of bombs.

We have only to look at the newspaper and newsreel photos of the cities of Manila, Cassino, Coventry, Stuttgart and Berlin of World War II days—literally destroyed to the ground either through ground bombardment or as a part of strategic bombing—to gain an object lesson. All had to rebuild almost from the ground up; a straining process for both the victor and the vanquished.

The world cannot continue to see such costly victories and retain any semblance to its present progress of civilized living. The economic ties between every continent, every nation, are too closely interwoven. Joe, and his boys in the Kremlin, have seen what sacrifices we, the richest nation in the world, are making to sustain life in the vanquished countries. And they know that the Soviets must wage their war as economically as possible. That is one reason why, today, we are fighting Russia's satellites—so that Joe can conserve the resources of the home country. He is really rich only in manpower.

Any nation that commits itself to fighting is going to consider the post-war economic factor—the productive facilities of the nation upon which the action is being taken. Thus, if we plan our defenses without taking into consideration the possibility that toxic agents may be used against us, if we do not provide ourselves with the means of defending against the enemy's initial toxic assault and then throwing back at him more, and better agents, than he could possibly throw at us, we are courting national disaster. As General Pershing

once wrote, in referring to the use of gas, "The effect is so deadly to the unprepared that we can never afford to neglect the question."

Fear of the unknown has always been one of mankind's big bugaboos. It is not strange for a man to be uneasy in the dark. But once the light is turned on, he loses this fear. So it is with toxic warfare. We must turn the light of public attention upon it to dispel the fog of misconception that has arisen around it. People like you—and many of you have had first hand experience with the chemical agents employed in warfare—can render a valuable service to the public by projecting the facts that can forestall the alarmist type of thinking that is associated with toxic agents.

Gas, to the general public, is a comparatively unknown weapon. The public doesn't know of the full advantage or capabilities it possesses. Nor is it realized that the stories about it being used to wipe out entire cities at one blow are but figments of the imagination of some lurid writer. Just like any other weapon, toxic agents have their specific uses—such as the disruption of industry without total destruction of the facilities.

Could our people, our factories, and our utilities carry on in the face of repeated gas attacks? I think so. In fact, I am positive they could. A free nation can, and does, perform the "impossible" under the most tremendous handicaps. The Battle of Britain is our example. Had the full and factual account of the destruction and misery that London, and other English cities, went through under Hitler's rain of death from the skies, been published prior to 1939, it would have been laughed off as sheer fiction. However, now the facts speak for themselves. While the British Tommies fought on foreign shores, the English civilians took the worst the enemy could throw at them and came up smiling. There is certainly no reason why we should think Americans would not do the same.

However, to make their task easier, if the time should come when they must continue operations under toxic agent conditions, we must give them a true perspective of why the use of gas must be considered a distinct possibility. Our preparations must be mental as well as materiel-wise.

We can't possibly know what the next war, if ever there is one, will bring. Therefore, we must plan. We must be prepared for any contingency that can be imagined, if we are to carry out the mission that has been given us in the defense of freedom. This preparation entails more than just across-the-board planning. Wars cannot be improvised if they are to be successful, either defensively or offensively. Thus, we must try to keep ahead of Joe in this new international guessing game. One way is to make full use of our great chemical industry. Bullies pick on "small fellas" more frequently than on "big guys."

And this brings us back to our starting point, or the subject announced for my talk—"The Needs of the Army," which I further pin-pointed to the needs of our own Corps. The principal need, as I see it, is "Public Understanding" of the fact that the size and capabilities of our chemical industry and the potential of toxic agents in warfare must be focused in the public eye as one of our bulwarks to prevent war and, if a conflict unfortunately does come, as our principal means of insuring victory.

Supply of gas protective equipment for soldiers and civilians stored by Germans near Wegberg and found by men of 8th Armored Division in March, 1945.
—U.S. Signal Corps Photo

paper sculpture by gorecka-egan

HANDLED WITH CARE

attention to quality in NIALK* chemicals persists even to the selection of containers which will most assuredly safeguard quality in transit

NIALK	Liquid Chlorine
NIALK	Caustic Potash
NIALK	Carbonate of Potash
NIALK	Paradichlorobenzene
NIALK	Caustic Soda
NIALK	TRICHLORethylene
NIAGATHAL*	(Tetrachloro Phthalic Anhydride)

*Trade-mark

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

The Chemical Corps in the Field of Research and Development

By

BRIG. GEN. WILLIAM M. CREASY

Commanding General, Chemical Corps Research and Engineering Command

Speech by Brigadier General William M. Creasy, Commanding General, Chemical Corps Research and Engineering Command, at annual meeting of Armed Forces Chemical Association, Chicago, Ill., May 16, 1952.

There was a time when two armies would line up on an open plain and hurl themselves at each other. You might have been killed by a blow from an axe, a thrust with a sword or spear, or you might have been crushed by the sheer weight of horses and men. These were all weapons you could see and hear and feel, and if you were lucky, you could dodge them. War was no fun, even then, but it was certainly much simpler than it is today.

The soldiers and the scientists of the twentieth century have discovered much more effective methods of carrying out the responsibilities placed upon the military by their government. As long as there are free nations on the one hand, and expanding nations bent on regional or world domination on the other, there will be an unending search for improvements in the art of warfare. For we Americans, though peace-loving, are not pacifists. We believe sincerely in certain basic liberties; we have always thrived on them; we want our children to have them; we have demonstrated our willingness to fight and to die to preserve them.

Today, these liberties are threatened. We may have to fight again as we have fought before. We must face this danger realistically. At the very least we must be prepared to resist effectively a heavy surprise attack utilizing all the newest weapons of modern warfare.

This is where the Chemical Corps enters the picture. For, in addition to weapons that lacerate the body or crush vital organs or produce permanent cripples, we must be prepared to withstand newer items which will affect large numbers of people and cover large areas. By that I mean an attack by the enemy with poisonous gases, casualty producing or even death producing germs, disabling or lethal concentrations of radioactivity. Perhaps he will have elected to use a combination of these or other mechanisms.

Imagine an American infantry squad struggling to advance through a rain of high explosives and small arms fire and, at the same time, being confronted with a well-organized C-B-R attack. Visualize one of our vital industrial plants attacked by an enemy and completely blanketed with mustard gas, infectious organisms or radioactive particles.

It is with such possibilities in mind that the Chemical Corps today has been assigned three important areas of responsibility in research and development, namely, chemical warfare, biological warfare and radiological warfare or, as these three fields of toxic warfare are more frequently designated, C-B-R warfare. Not only must the Chemical Corps find ways for this Country to protect itself against C-B-R warfare, but it must also insure that our defense, if necessary, shall not be a passive one. The research and development mission of the Chemical Corps is to give the United States a qualitative superiority in C-B-R warfare over any potential enemy.

This is a task which should be of interest to every thinking citizen of this country. The success of this mission is important to the welfare not only of our Armed Forces, but also of everyone of us here at home. For it would be foolish to assume that in the next war, if it comes, our cities or our farms would again be spared its destructive fury.

For this reason, I would like to take just a few minutes to tell you some of the problems we must solve, and to mention some of the highlights of the Chemical Corps' Research and Development program for C-B-R defense.

In working on C-B-R defense, we find it convenient to think of the main problems as being made up of four parts: detection (including identification), protection, decontamination and medical aspects. In detection, we are concerned with discovering as quickly as possible the presence of a toxic agent. Protection is the problem of shielding human beings, animals, and food and water supplies from the effects of these agents. Decontamination is the problem of removing these agents

—U.S. Air Force Photo
Direct hits by two Napalm bombs turn rail facilities near Pyongyang, North Korea, into a raging inferno.

from water, from the ground, from clothing and from all other surfaces. Finally, the medical aspects in which we are interested concern the medical treatment of individuals who have been exposed to C-B-R agents.

As you are probably aware, certain types of war gases are difficult to detect by the human sense of smell. What we need, then, is a better nose—a chemical nose which will smell out and identify as many different types of chemical agents as possible. Furthermore, this chemical nose must be connected to a mechanical brain with electronic vocal cords so it can announce its findings.

Radiological agents pose a somewhat different problem. Even a short exposure to intense radiation can be fatal. On the other hand, a man can be exposed to a low level of radiation for a long time without harm. For example, it would make little difference that a boxer was getting hit with left jabs or right uppercuts in round six, if he could tell how much punishment he had taken since the beginning of the fight, and how much he was capable of absorbing without injury. We are now developing a radiation dosage indicator, a chemical instrument, which will—when his opponent is RW—give him this information.

Biological agents offer the most difficult detection problem. Until recently, it took almost four days to discover the presence of, and identify, biological agents in air. Now, this discovery and identity time has been cut to 15 hours by a new filter device developed by the Chemical Corps. This is a remarkable improvement, but we cannot stop there. Obviously, the sooner we know just what kind of germ has been loosed upon us, the more we will be able to do about it. Therefore, we are continuing our efforts to reduce this crucial interval.

In the field of protection, one of our principal aims is the continual improvement of the protective mask—not only to keep pace with new developments in C-B-R warfare, but also to make it more convenient for the wearer. However, the best of masks is not enough protection against mustard gas or, for that matter, any material which attacks through the skin. This clearly establishes a requirement for clothing which can withstand the action of C-B-R agents and protect all parts of the body from them. Of course, we realize that such individual protection is likely to be bulky and relatively uncomfortable for long periods of wear. That is why we are now putting quite a bit of emphasis on the development of *collective* protection. By this, I mean equipment which can be used to make any reasonably air-tight building or shelter safe against air-borne toxic agents.

In all fields of defense, flexibility must be a primary aim. Insofar as possible, we must develop defensive materiel and techniques which can be easily adapted for use against all forms of C-B-R warfare. In the field of decontamination, for instance, we are striving to develop mobile equipment which can be used to cleanse large ground areas of persistent gases, biological agents or radioactive particles, as the situation may require.

These are but a few facets of our broad program. They may well be sufficient to indicate the tremendous scope of the problem besetting us in C-B-R defense. At best, it is a large order. To fill it, however, the Chemical Corps has a large and growing research and development organization. The principal unit of this organization is the Research and Engineering Command whose headquarters are located at Army Chemical Center, Maryland. It is this Command which bears the weight of the responsibility for research and development in C-B-R warfare.

I do not mean to imply that all the brains behind the research and development in chemical, biological and radiological warfare are to be found in our Command. As a matter of fact, we constantly receive invaluable guidance from the Research and Development Board, the Joint Chiefs of Staff, the Army General Staff and the Office of the Chief Chemical Officer. Furthermore, we rely heavily upon the cooperation of the Navy, the Air Force, the other Army Technical Services and the other Field Commands of the Chemical Corps. In the long run, however, the research and engineering people, and through them American Science and Industry, will be called upon for the technical answers. Given sufficient funds, personnel and time, there is no reason why we cannot deliver as required.

On the operating level of the Command, we have six separate agencies staffed with competent scientists and administrators, both civilian and military. Each agency is organized to accomplish a specific phase of the research and development process.

For basic and applied research, we have the Medical Laboratories and the Chemical and Radiological Laboratories, both at Army Chemical Center; and the Biological Laboratories at Camp Detrick near Frederick, Maryland.

When a device has been developed by one of these agencies, it is referred to the Engineering Agency at Army Chemical Center for its final design. Field testing of all Chemical Corps materiel is carried out by one of our two Proving Grounds—the Edgewood Proving Ground at Army Chemical Center, or the Dugway Proving Ground in Utah.

In addition to the operating agencies which are a part of the Command, there are several specialized groups which work beside us to help us accomplish our mission. These are evaluation agencies such as the Operations Research Group

—Firestone News Service Photo
This completely assembled gas mask may save a life. The mask is made of molded rubber with metal frames holding the safety glass eye pieces. The canister contains charcoal and chemicals and a special filter paper to protect the wearer from poisonous gas.

and the Chemical Corps Board, and the Technical Committee which coordinates the work of our Command with that of the other branches of our Armed Forces.

This may sound like a pretty impressive array of talent and facilties. It is—but it isn't enough. Actually we are a very small Corps and have neither the personnel nor the facilities to handle, by ourselves, the work whch we are called upon to do, in view of the present day threat to our national way of life.

Many of you, I imagine, can remember a far different period in our history. Back in 1922—thirty years ago—we were working on such things as the Livens Projector and the Stokes Mortar. We had discontinued work on a portable smoke generator because the smoke candle appeared to be quite satisfactory for our purpose. All together, that year, we had just 52 projects. In fact, our total research and development funding for the fiscal year of 1922 was in the neighborhood of $70,000.

But the point I want to make here is that, while back in 1922 most of our research and development work was done at our own laboratories and testing grounds, today our program has outgrown our facilities. We must depend upon outside help.

—Chemical Corps Photo
Research work during World War II even led to the development of a gas mask for dogs.

Fortunately, we are getting this help from two main sources: other Government agencies and private industry. Not only do we work closely with the Navy and the Air Force on many projects but we also call upon such organizations as the National Bureau of Standards and the Public Health Service. In addition, we benefit considerably from the information and advice given us by some of this Country's top research and production leaders who serve on committees to advise the Chemical Corps and the Department of Defense.

But by far the most important source of our help is the industrial might of our Country. Today, a large proportion of our research and development work is done in civilian laboratories and industrial concerns. Without these added facilities and the services of their highly competent personnel, many of our most important accomplishments would have been impossible.

Let me cite an example where civilian industry played a particularly important role. One such case was Napalm. The Napalm fire bomb, as you know, has been one of the United Nations' most effective weapons in Korea. A large part of the development work on Napalm was done by civilian industry under contract. We of the Chemical Corps, quite properly, depend upon the industrial ingenuity of this Country. We would be making poor use of our industrial resources if we did not keep our eyes and ears open for new development which might be adapted to the defense of this Country.

(Continued on page 47)

PROCUREMENT AS I SEE IT

By

BRIG. GEN. H. M. BLACK

Commanding General, Chemical Corps Materiel Command

Address given by Brigadier General H. M. Black at the Armed Forces Chemical Association Annual Meeting, Chicago, Ill., May 16, 1952.

I know that you members of the Armed Forces Chemical Association are keenly interested in the over all operation of the Chemical Corps. I know that you are further interested in procurement of Chemical Corps materiel. You are probably asking in your own mind—how is Chemical Corps purchasing done? Where is it done? Who does it? What kind of an organization is involved?

I want to discuss with you briefly some of the aspects of Chemical Corps procurement—to acquaint you with some of the operational phases of our procurement program.

On November first of last year the Chief Chemical Officer created three Chemical Corps Field Commands—one of these is the Chemical Corps Materiel Command which is under my command. Chemical Corps Materiel Command is situated in Baltimore, Maryland. It has operational responsibility for, and direct command over, all Chemical Corps manufacturing, supply and procurement installations and activities. It supervises and directs the execution of the program of the Chemical Corps pertaining to: Procurement of supplies; receipt, storage and issue of disposal of Chemical Corps materiel; the care, preservation and maintenance of supplies and equipment; and the acquisition, leasing, construction, maintenance and disposal of Chemical Corps facilities.

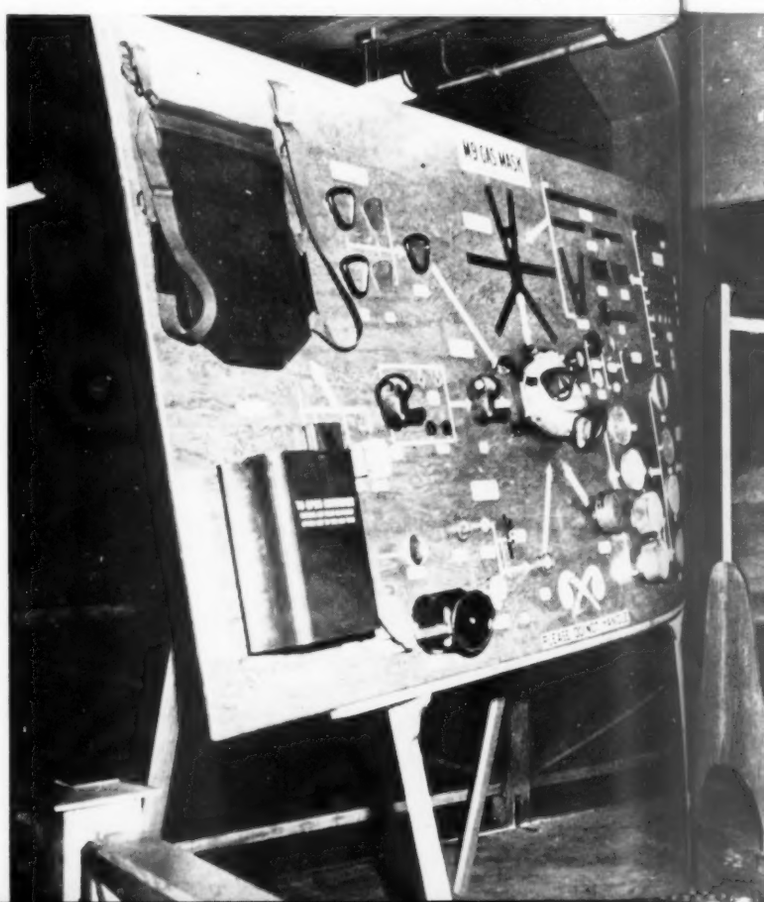
The Chemical Corps Materiel Command has three Arsenals —Pine Bluff Arsenal at Pine Bluff, Arkansas; Rocky Mountain Arsenal at Denver, Colorado; and Edgewood Arsenal at Army Chemical Center, Maryland. We have three depots—Deseret Chemical Depot, Tooele, Utah; Midwest Chemical Depot, Pine Bluff, Arkansas; and Eastern Chemical Depot at Army Chemical Center, Maryland. We have six Chemical Procurement Districts situated in New York City, Boston, Chicago, Atlanta, Dallas and San Francisco. We have five Chemical sections of General Depots at Atlanta, Memphis, New Cumberland, Pennsylvania, Ogden, Utah, and San Antonio. We have an Inspection Equipment Agency and a Technical Escort Detachment at Army Chemical Center, Maryland. In addition we have responsibility for procurement activities only at Dugway Proving Ground, Utah, and Camp Detrick.

The Chemical Corps Materiel Command Headquarters in Baltimore is a complete Class II Army installation with its own personnel office, fiscal setup, administrative service office, comptroller, and most other divisions and offices normally found on a post, camp or station. We do not do any procurement in Baltimore—that is, we award no contracts or issue any purchase orders. With this organizational structure and overall mission as a background, I want to discuss with you some of the more important phases of Chemical Corps procurement.

The two principal methods of procurement are by means of formal advertising and by means of negotiation. We use that method of procurement which is most advantageous to the Government—price, quality and other factors considered. All supplies, equipment and services are secured to the maximum extent possible by contractual means. Full and free competition is secured in all possible areas.

The Munitions Board has assigned procurement responsibility for certain items or classes of items to the Department of the Army. The Department of the Army, in turn, assigns

Display board at headquarters of Boston Chemical Procurement District. —U.S. Army Photo



the procurement responsibility for certain of these items to the Chemical Corps. Within the Chemical Corps we assign responsibility for procurement of certain types of items to individual procurement districts—for example, chemicals to New York, gas masks to Boston, etc.

Under the Single Services Procurement Assignment Program the Air Force is our best customer from a "dollar" point of view. We are responsible for the procurement of *all* incendiary and smoke munitions for the Army, Navy and Air Force.

In round numbers our total funds available to Chemical Corps during current fiscal year ending June 30 amount to approximately 500 million dollars. There is no way to accurately forecast the volume to be expected for the fiscal year 1953, which starts this coming July. Budget estimates have to cross many hurdles before they become appropriations. The Military Appropriations Bill is generally reduced before it becomes law. As a bold "guess-timate" it may be that the Chemical Corps portion of the '53 program may approximate 300 million dollars.

We have tried to locate our Procurement Districts as strategically as possible throughout the country so that they will be as convenient as possible to prospective manufacturers and suppliers. A manufacturer or supplier can get information concerning prospective Chemical Corps procurement from any Procurement District because copies of invitations to bid and requests for proposals issued by any procurement district are distributed to each of the other districts. Specifications and drawings are all available at any district office.

Our Chemical Corps Procurement Agency at Army Chemical Center, Maryland, is maintained for the purpose of procurement of research and development services and supplies, procurement for Army Chemical Center. Chemical Corps Procurement Agency does not ordinarily purchase Chemical Corps munitions or components. Our Procurement Districts normally award such contracts.

During peace time the Chemical Corps develops lists of planned producers for strategic items so that there will be sufficient industrial capacity for mobilization requirements. We make every effort to broaden the base of procurement to insure a flow of supplies and to fulfill strategic considerations by developing multiple sources.

I know that you are especially interested in this matter of Defense Contracting with small business, just as we are interested in it. We have taken and are taking a number of steps to assist small business. Approximately 80% of our current dollars are placed in businesses employing less than 500 employees.

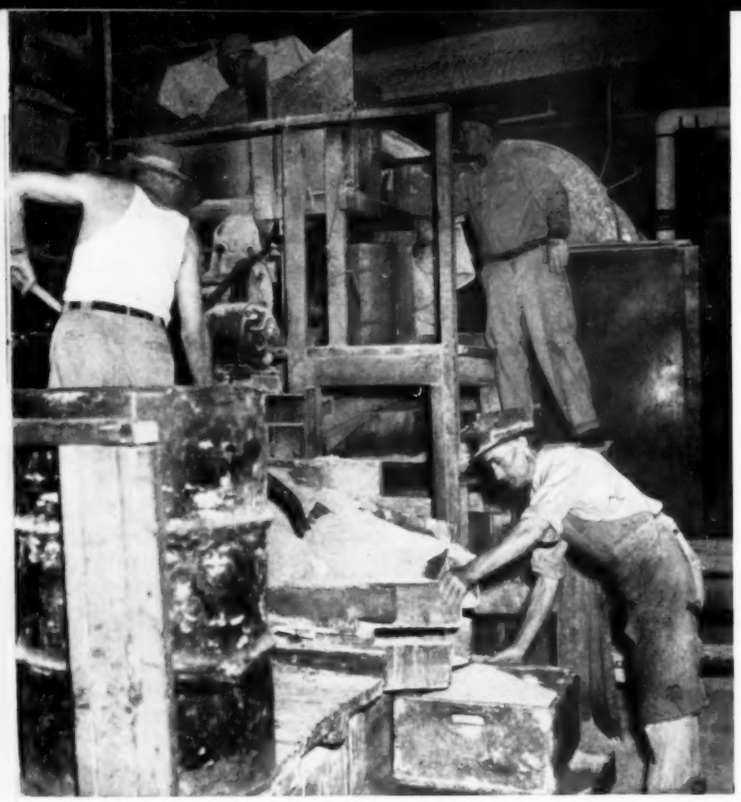
We have appointed a Small Business Specialist at all procurement activities, at Chemical Corps Materiel Command and at the Office of the Chief Chemical Officer. These Small Business Specialists can help and are helping small business by acquainting such suppliers or dealers with purchase methods and practices as established by law and regulations; by referring such suppliers and dealers to the proper procurement offices when the Chemical Corps does not have procurement responsibility; by acquainting small business with defense contract financing, and in many other ways. These small business specialists examine proposed contracts to determine whether they are susceptible to award to small business. There are certain conditions, which are dependent upon each individual case, where preference is given to small business in the award of a contract.

We have reviewed our requirements for the purpose of determining these items which are normally susceptible to procurement from small business, thus assisting small business and at the same time broadening the industrial base of suppliers.

We have reviewed our procurement methods to determine whether changes might be affected which would be of assistance to small business.

We have stressed the problem of small business with all

Infra-red driers remove all traces of moisture from the vacuum-sealed cans containing new-type gas masks being procured for the Chemical Corps.
—Firestone News Service Photo



—U.S. Army Photo
The procurement of Napalm from manufacturers has been one of the Materiel Command's biggest jobs in the Korean conflict.

levels of procurement personnel; we have stressed the need for broadening the industrial base of suppliers.

We have encouraged subcontracting. Each substantial negotiated contract is examined to determine the extent to which subcontracting should be encouraged or required.

The current problems in connection with the labor surplus areas are of concern to all of us. I know some of these problems are vital to some of you.

A Surplus Manpower Committee has been created whose members are appointed by the Chairman of the Manpower Policy Committee from representative government departments and agencies. The Defense Manpower Administration certifies, under standards established by the Secretary of Labor, the existence of labor surplus areas. Such areas are certified to the Department of Defense in order that preference may be given to them in the placement of *negotiated supply contracts*. Preferences may be given only to the extent that normal negotiation policies and procedures will permit. No preference may be given in the case of formally advertised contracts. Price differentials are not now authorized under this policy.

Cost is a major factor which is considered in all Chemical Corps procurement other than for research and development. We try in certain cases to provide maximum incentive to the producer for the reduction of his costs. We endeavor to secure full and free competition where applicable, in order to secure the best available prices. We attempt to place contracts with a view to economies in the use of transportation facilities.

I want to discuss—briefly—Defense Contract financing. It is evident of course that we prefer private financing, without government guarantee. On the other hand the providing of funds for payment of expenses of performance of contracts is an essential element of defense production. In many cases the contract financing system makes possible production in volume that could not be accomplished otherwise.

The next most desirable means we have to assist in financing contracts is by making progress or partial payments. Such payments are made to the contractor as work progresses under a contract, upon the basis of costs incurred, of percentage of performance accomplished, or of a particular stage of completion. Such progress payments are entirely different to payments for partial deliveries accepted by the Government under a contract, or partial payments on contract termination claims.

The third most desirable method of financing contracts is by means of guaranteed loans commoniy referred to as "V-loans." These loans are essentially the same as other loans made by financing institutions without guarantee, except that under a standard form of guarantee agreement the guaranteeing agency is obligated on demand of the lender to purchase a stated percentage of the loan and to share losses in the amount of the guaranteed percentage. Government funds are not involved except for purchases of the guaranteed portion of loans or settlement of losses. Guaranteed loans are established primarily for working capital purposes. Guarantee authority is not used for loans for facility expansion.

The least desirable method of contract financing is by means of advance payments. Such payments are advances of money, made by the government to a contractor prior to, in anticipation of, and for the purpose of complete performance under a contract or contracts. Advance payments are made only to prime contractors. They are expected to be liquidated from payments due to the contractor incident to performance of contracts. They may be made to prime contractors for the purpose of making sub-advances to subcontractors.

We are making a concerted effort to provide industry with the maximum advance notice on planned procurement actions. Our policy is to allow 30 to 45 days for the preparation of proposals preceded by advanced-notice letters. Our deliveries are aimed at a realistic target based on material lead time. You may have noticed that Raleigh Hanel, Jr., Publisher of "Washington Salesletter," April 11, 1952, refers to this policy as "one of the bright spots in the current procurement picture."

In addition to the procurement function of Chemical Corps Materiel Command, there are two other principal functions, inspection and supply.

The technical inspection and surveillance activities insure that supplies and equipment which are purchased are delivered in accordance with specifications and drawings. Original inspection and acceptance may be accomplished at the plant, or other delivery point or at destination. After materiel has been delivered we must further insure that it remains in accordance with specifications by making surveillance tests as required. Finally, after purchase has been made and inspection completed we have our Supply Organization for the receipt, storage and issue of Chemical Corps materiel. Materiel in storage requires varying degrees of servicing, repair, and maintenance; also reclassification as specifications are changed from time to time.

I wish to take this opportunity to announce the establishment of an Industry Advisory Committee for Smoke and Incendiary Munitions. We in the Chemical Corps will look to this group to guide us in making improvements in our specifications, to assist in making our products more produceable from an industrial viewpoint. The assistance given us every day by you members of this association has been a major contribution by bringing to our attention improvements which you have gained by experience. For this aid the Corps is indeed grateful.

NOTICE

The Board of Directors of the Armed Forces Chemical Association will meet in Atlantic City, N. J., during the American Chemical Society Meeting. The Directors' Meeting will be held on Wednesday, September 17th. The time and place will be specified in individual notices to all Directors.

Col. Ragner E. Johnson, Commandant of the Chemical Corps School.

THE FIELD SERVICES—HO

"At the Chemical Corps School we teach both officers and enlisted men of our own Corps, and selected students, military and civilian, from all the other arms and services of the Army; from the Navy, Coast Guard, Marine Corps and Public Health Service . . ." Above, a Coast Guard lieutenant, at left, an Army major, and a Navy WAVE lieutenant learn about radiological defense from a Chemical Corps School instructor.

By

COL. RAGNER JOHNSON

Commandant, Chemical Corps School

Speech made by Colonel Ragner Johnson, Commandant, Chemical Corps School, before the Annual Meeting of the Armed Forces Chemical Association, Chicago, Ill., May 16, 1952.

I am indeed happy to be privileged to speak to you this morning. General Greeley, who was to have addressed you as the commander of one of the three major Chemical Corps commands, is unfortunately not able to be here. He deeply regrets that he cannot greet you in person. But he has deputized me, as his second in command and the director of one of his three principal training activities—the Chemical Corps School—to tell you about "The Chemical Corps Field Services, and How They Use the Products of the Chemical Industry."

The term "field services" in the Chemical Corps refers, first, to the Chemical Corps Training Command stationed at Fort McClellan, Alabama; second, to all the Chemical Corps troops serving with the field armies, both in the United States and overseas. In Korea, now, for example, there are the Second Chemical Mortar Battalion, which has added fresh honors to its already long and glorious battle record; the Fourth Smoke Generator Battalion, which is doing a splendid job protecting our installations from enemy air bombing; and numerous service units and chemical staff sections throughout the Eighth Army, its Corps and Divisions. And third, we could consider, as part of our "field services," every man in the Armed Forces who uses any item of Chemical Corps materiel—flamethrower, fire bomb, protective mask, and so on—either to defend himself or to attack the enemy. But my remarks will be restricted to the first two.

Before discussing how the field services are using your products, let me tell you a little more about the training command, which now for the first time combines all of the training activities of the Corps under unified control. It includes new recruits in the Replacement Training Center, companies and battalions in unit training, and individual specialists at the Chemical Corps School. A little over a year ago we started moving these activities to Alabama because we needed a post with plenty of room for ranges, fields and maneuver areas, where training could be carried on all year round. Fort McClellan, built on land that has been used for military training, in all our major wars since the Revolution, is an ideal location, with nineteen thousand acres on the main post and twenty-two thousand more on the near-by Pelham range. Now it lacks the modern buildings of adequate size, and the up-to-date equipment, that we need in order to give the first-rate instruction the Corps is capable of. But we are going to get them within the next two years. Construction has already started, and contracts are now being negotiated for a new Training Command Headquarters, main school building, laboratories, and all the other structures required to make it the best training center in the nation. Before very long, Fort McClellan will also have a training center for some three thousand WACs, and a Wherry Housing Project of a hundred and seventy-five family units. All in all, about twenty-one million dollars will be spent on construction there in the next two years, nine million of it for the Chemical Corps—two and a half million for the new school building alone.

So you can see that we're not expecting any decrease in our activity in the near future. Some of our recent growth comes from the fact that the Chemical Corps is now responsible not only for chemical warfare training but also for biological and radiological warfare; instead of *CW*, you hear a lot these days about *C-B-R*. But that doesn't mean that we are no longer the *Chemical* Corps. And I don't think this society is about to change its name to the "Armed Forces C-B-R Asso-

ciation." Chemistry is still the basis of everything we do and use in the Corps, and the chemical industry will always be our first love.

You may think that all this about the Training Command is wandering away from the main subject, I believe, though, that I can show you how it fits in. A few weeks ago at Fort McClellan, a board of officers was interviewing applicants for Officer Candidate School. If you have ever sat on that kind of board, you know you work up a set of three or four favorite questions that you ask all applicants, to see how they'll react. On this occasion, the president of the board, a lieutenant colonel, asked one candidate *his* favorite question: "Soldier, what are we all in the Army for?" The answer he wanted, of course, was: "To fight—to win success in battle"—or words to that effect. But the candidate said, "I'm sorry, Sir, but I'm afraid I don't understand the question."

"Now, Soldier," the Colonel said, "What purpose do we all have in common—you and I, and the major and the captain here, and everyone else you know in the Army? What goal that we're all working for?"

"Oh," said the candidate, "to retire, sir."

Well, they passed that candidate, because it was a true answer. We *do* all want to live long enough to retire, and we are counting on industry, especially the chemical industry, to turn out products that will help us live that long. Our job in the Training Command is to teach the rest of the Armed Forces to use those products most efficiently. If the field services as a whole, and most of all the troops in combat, are the ultimate consumer of your goods, then the Training Command is the best salesman and demonstrator you have. We show your customers not only, *how* to use the goods, but when and where and why. At the Chemical Corps School we teach both officers and enlisted men of our own Corps, and selected students, military and civilian, from all the other arms and services of the Army; from the Navy, Coast Guard, Marine Corps, and Public Health Service; from the Air Force; from Civil Defense agencies; and from Canada and other friendly nations. Each year about three thousand of our alumni go out in all directions as traveling salesmen, passing on to the other men in their units an understanding of chemical and biological and radiological warfare, and of how to use chemical products, either to defend themselves against those types of warfare, or—if total war comes again—to wage them against whatever enemy might use them on us.

What, then, are some of the products we use—or might use—and in what ways? Let's begin with the recruit who arrives, fresh from induction or enlistment, at our Replacement Training Center. We might consider the gallons of ink that will be spread upon reams of paper—both chemical products—to keep his record until he retires thirty years later. But those, and his G.I. soap and Blitz cloths and gunpowder are expenditures common to all soldiers. What about the Chemical Corps soldier training period? One of the elements he comes in contact with most, and more than most others, is chlorine. I don't need to tell you how the Germans in World War One discovered its effectiveness as a killer, or how soon it was surpassed and replaced by others more deadly. But you may not realize that it is now used more than ever, both as a component of many chemical warfare agents and in decontaminating materials. Alone, it is still useful as a training aid, in the gas chamber and in "confidence courses" in compounds, it forms part of mustard gas, phosgene, cyanogen chloride; and in the two most common decontaminants, "bleach" and *DANC*. It might seem odd to a layman, though surely not to the chemist, that the same element should be a part of a toxic agent and of the worst enemy of that agent—but that means all the more business for the chlorine industry.

Another item, manufactured by at least nine different companies and a very important feature in chemical training, is the fuel thickener often called "Napalm." It coagulates gasoline into thickened, jelly-like fuel which gives the flame thrower extra range and accuracy and which is the filling in most effective types of fire bombs. General Bullene has passed along to us the news that the one-fifty-five gallon belly-tank full of Napalm, dropped from our planes in low-level attacks, has knocked out more enemy tanks in Korea than any other single weapon. Since the Chemical Corps service troops are responsible for mixing this thickened fuel and for the filling and maintenance of flamethrowers, the Chemical Corps recruit—and all other Chemical trainees, up through the advanced course at the Chemical Corps School—are constantly being taught to prepare and employ the fire-producing weapons. The amount of Napalm we use at Fort McClellan would probably not make a very impressive statistic, but the amount of Napalm expended in combat has been tremendous.

I have already mentioned the decontaminating agents, "bleach" and *DANC*. There are others—caustic soda, good for breaking down cyanogen chloride, hydrogen cyanide, or mustard; sodium bicarbonate and washing soda are two more. Our Chemical trainee gets plenty of work in decontaminating exercises, besides the decontamination that has to follow every training period in which persistent agents like mustard are used. Similar methods of decontamination, with these and other chemicals, must be employed against biological and radiological warfare agents. If any one of the three "area weapons" in the C-B-R arsenal is used in a future war—and it is quite logical to expect that any or all of them will be—chemicals in massive quantities will be needed to counteract

BRIG. GEN. LEONARD J. GREELEY
Commanding General, Chemical Corps Training Command

them, and men who know how to use the right chemicals in the right way.

I don't think I need to go into the chemical properties of the gas mask—or "protective mask," as the latest model is called—and the training that goes with it. Everybody in the Armed Forces gets a certain amount of "gas mask drill," and unfortunately some seem to think that's all there is to chemical warfare training. The Chemical Corps troops and the students at the Chemical Corps School probably get more of it than anyone else, because we realize how truly important it is. The protective mask really protects, not only against all the known war gases in the lungs, face, and eyes, but also against many of the agents of biological and radiological warfare; that's why we don't call it just a "gas mask" anymore. Every combat soldier is continually impressed, and rightly so, with the idea that his rifle—or whatever weapon he is armed with—is his best friend. I wouldn't dispute that; but I want him to know that if his rifle is his best friend, his protective mask is his sweetheart—a good companion to sleep with.

One more area of Chemical Corps training we must not forget is that of smoke. World War Two showed us how vitally important smoke can be, and some of the different ways it can be used; and we are still learning new facts about it in Korea. The two chief sources of military smoke are white phosphorus—in bombs, shells and grenades—and fog oil, the agent produced by the mechanical smoke generator. Here again, the rest of the Army, Navy and Air Forces may *use* more smoke than the Chemical Corps; but we work out the tactics and technique, we act as middle-man for much of the materiel, and we provide—directly or indirectly—most of the training. We learned the hard way, for instance, that it is not enough just to throw up a smoke screen around your own troops so that the enemy can't see what you're doing. That smoke screen makes a beautiful target for him, and he'll hit it with everything he has—until it no longer makes any difference what you *were* trying to do; you can't do it anyway. Instead of that, you have to get the smoke in the enemy's eyes first—put the smoke on him, not yourself—so that he can't even see what direction you are in. Then some more smoke from the mechanical smoke generators to protect you from his air observation and bombers, and you are ready to go to work.

After the Chemical Corps recruit finishes his basic training and is assigned to either a combat or a service unit, his training, of course, still goes on—indeed, more intensified than before. The rudiments give place to the refinements; and chemical products are still the tools and materials he has to work with. He learns to improvise with them, to find ways of using them that aren't in the books. Sometimes he is already a trained chemist himself—for, contrary to what many people think, chemists in the Army *are* sometimes assigned to the Chemical Corps. In World War Two, there were chemical laboratory companies in which most of the enlisted men had at least bachelor's degrees in chemistry, and over half were Ph.D's. Today our privates are not quite so highly educated. But the Chemical Corps does have about a thousand scientifically trained enlisted men—chemists, biologists, physicists, engineers—assigned where we think they will do the most good. Sometimes, men like these devise new ways to use chemical products and equipment: ways that the Army did not think of when it first designed or procured these items.

A class of Navy officers works in the field under the guidance of a Chemical Corps instructor, standing at right.

For example, during the war two laboratory companies went overseas, one to Europe and one to the Pacific. The job they were trained to do was to analyze enemy war gases, either in captured munitions or from samples collected in combat. Toward the end and after the surrender, the company in Europe had a few chances to work on captured German shells and storage containers, including those that held the long secret G-gases when we first found out about them. But since gas was never used against us in battle, our laboratory companies kept busy on other jobs. The company in the Pacific was especially concerned in solving problems raised by the tropical climate—such as protecting materiel from rot, rust, and decay, or helping the medics check the spread of disease. It was found that liquid bleach, chloride of lime, made an excellent insecticide; the lab company manufactured it in large amounts, and the decontamination companies sprayed it from the four-hundred gallon decon apparatus—a fine illustration of the way our service units can work together for the whole combat force.

Here is another example of Chemical Corps improvising, also taken from the history of the four-hundred gallon decon apparatus—which has in fact, been used for all sorts of purposes besides decontamination. It has been not only a bug-killer, but a paint-sprayer, a fire-engine, and a water supply for field shower baths. In 1948 during "Operation Vittles," when our Air Force was running the air-lift into Berlin, the extremely cold weather was causing heavy frost and ice on the control surface and wings of the planes. Scraping and sweeping it off between flights was wasting much valuable time. Then someone thought of spraying the planes with isoprophyl alcohol, and using the four-hundred gallon decon apparatus to do it with. That cut the frost more quickly and efficiently than any other method, and probably saved lives as well as time.

There is one more product of the chemical industry that I have not mentioned, partly because it is not as uniformly produced as the others, but chiefly because it would take too long to explain fully the many ways in which we put it to work. However, it is of incalculable value; and I consider it the most important factor that the industry has contributed to our Corps—namely, personnel. A vast number of trained men, and some women, too, from industry as well as the universities, have joined our ranks during war and peace, and will, I trust, keep coming to us in the future years.

These remarks, I hope, will give you some idea of a few of the ways in which the Training Command and the combat and service units of the Chemical Corps employ the products they receive from the chemical industry. As I said before, we are your customers, the ultimate consumers. We leave to others the jobs of designing and making and distributing the goods; we use them up, and call for more. From where we sit, we know that the Research and Engineering Command is working, in collaboration with industry, to develop the very best chemical materials and equipment, to meet the needs of the field. And we know that the Materiel Command, also working directly with industry, will see to it that those products are manufactured as well, and as economically, and delivered as quickly, as is humanly possible. For our part, we want to promise you that they will be used as efficiently and intelligently as you hope they will be.

"Our Chemical trainee gets plenty of work in decontaminating exercises . . ." Chemical Corps men spray a contaminated area from a decontamination truck, wearing protective clothing for additional protection.

SMALL BUSINESS AND DEFENSE CONTRACTS

Address delivered by Mr. Telford Taylor, Administrator, Small Defense Plants Administration, at 7th Annual Meeting, AFCA.

I am very grateful for this chance to meet with your Association and describe the program of the agency that I represent here. I don't want to talk very long. I know that we have a question and answer period following, and my experience has been that oftentimes the questions and answers are more interesting than the remarks previous to them. So before we come to the questions, there are really only about two things I want to try to do.

I want to come very immediately to the subject I am supposed to be speaking on, and that is "Small Business and Defense Contracts"; but before getting to that, I do want to take a minute or two to try to outline what we think the small business problem is, so we will have some idea of the problem before we get the program. As you know, this small business problem is by no means a new one. The agency that I represent is new, but the problem itself has been with us for some time and there are special committees of the House and Senate dealing with small business, and beyond that there are many business specialists in the Armed Services, small business branches of the National Production Authority.

In view of all that, why was it thought necessary to set up a new agency? What is the reason for our existence? Well, very briefly, the reason for setting up the agency was Congressional realization that the Defense Program, the mobilization of industry defense production, was inevitably bringing about some very serious dislocations in the economy of the country and in the way that economy has traditionally operated.

One result of the Defense Program is that the government has come to all of us and taken a lot more money out of our pockets than any of us like; and secondly, while the government has been taking our money with one hand, with the other hand it has been going around and sweeping out of the normal market, the free market, large quantities of steel and copper and aluminum and taking them out of the channels of ordinary civilian production and making them no longer available for civilian purposes, no longer as freely and fully available as they were before. Finally, having taken all this money with one hand and having swept up all these metals with the other hand, the government takes both the money and materials and sort of scatters them over the country in the form of defense contracts. That is where the money and metals go—to the people who get these contracts.

All these factors and particularly the last two come down with special weight and sharpness on small business as compared to large business, and I just want to analyze that for a minute.

Take the case of copper, steel and aluminum, these scarce metals—or which were scarce until very recently and may well be again. During the second quarter of this year there were nearly 15,000 small companies in the country that had their normal allocation of these metals cut back to 30 per cent of their normal use. The small businessman is, as a rule, not well equipped to survive against these cutbacks as the large businessman for reasons which are obvious and some not so obvious. The fundamental reason is that the large business is more varied in its enterprise and can make up in one field what it might be cut back in another. Of course, the hope is that the government Procurement Program will come into play and make up for these cutbacks in metals, and the man who has had a cutback for civilian use will be able to get a contract and get the metals and stay in business in that way. But, most unhappily, the two things do not mesh and do not fit and Procurement does not automatically flow in where a person has been cut back in the normal use of metals.

Furthermore, there is a very important factor, which is true regardless of the metals picture, which, as I have said, is not easily remedied: The government is now buying nearly 20 per cent of the entire national output of the country, so that the government as a market for goods has become a very dominant factor in the situation, instead of as formerly a comparatively minor factor. And, finally, this Procurement Program, which becomes of such importance in the total picture, once again, does not flow out evenly, unless we take steps to see that it does, and for this there are many reasons.

The most important single reason probably is the nature of Procurement as we have it today. So much of what the government buys is in the form of large complicated things, such as planes and tanks, which the small man cannot handle on a prime contract basis. The Air Force, when I took this position six months ago, estimated that small business could perform, or was physically capable of performing, only about 15 per cent of all the Air Force bought; and in the six months I have been in office, their estimate has dwindled from 15 per cent to 9 per cent.

This very important factor, the nature of Procurement, coupled with other factors which I will come to in a minute, has resulted and is resulting in a constant downward trend in the volume of prime contract procurement that small business gets. The figures are all published by the Munitions Board, as a matter of public record. In 1950, small business was getting 25 per cent of all prime contracts in terms of dollar volume. In fiscal 1951, it had gone down to 21.5 per cent; and in the fiscal year up to February, it had dropped further, to 18.4 per cent. During the months of February and March of this year, the figures have taken another precipitous drop. I don't want to stress these figures on the basis

of the particular month too much, because the curve is not an even one as particularly large contracts may fall in one month or may vary the picture greatly; but the fact of this constant downward trend is quite undeniable.

What can be done to counteract the trend? We can't, of course, change the nature of Procurement. We have to buy for Defense Programs the things it needs, not necessarily the things that small business can make; but small business can and does make a great many things that are vital to the Defense Program. Our purpose in this field is to try to see that small business is given a chance to make what it can. Quite apart from the character of the goods currently being bought, are other reasons why small business is not getting all it could handle. These are to some extent human factors.

A Procurement officer has many problems and only 24 hours in a day. He must work within the rules and regulations that have been laid down for him. He must be responsible in line with the directions given. It is very much easier for him, when he is negotiating contracts, to negotiate with companies he has known before, which may well tend to be the big, well-known companies, rather than to get out and look and see what else he can find in the way of eligible contractors. It is that element that we are going to try to cope with under the program which I will outline in just a minute.

For all these reasons the small manufacturer has been having a rough time getting a fair piece of this market, and Congress felt and I feel that this is a bad thing, not only for the small businessman, but for everybody; because if these contracts for the Defense Program are filled by a few companies only, that is going to slow down Procurement.

I have been talking primarily about prime contracts, and, of course, for the small manufacturer the sub-contracts may, in some field, be more important and in many fields equally important. A large part of our program is going to be directed to trying to spread out sub-contracts and increase the small business share of those. But I do not go along with the school of thought that some people out here have, that the small businessman has no place in the prime contract program. I think he does have a place in that program, and I think it is up to us work on that phase of it as well as on the sub-contracts.

In short, this is the small business problem: Material restrictions, the difficulties in spreading procurement, work a dislocation and pinch in which the small businessman is caught, and our whole purpose is to try to cope with that. The benefits to be derived, if we successfully cope with that problem, are several and very important in terms of the immediate success of the Defense Program. It seems to me to stand to reason that maximum speed and efficiency in the production of arms must mean that we make maximum use of all of our facilities, large and small. To dump all the work on relatively few companies is the quickest road to bottlenecks and waits. To expand a large company to take on a new piece of work, if there is a small company that can handle it, is a waste of time and labor and materials that go into that plant expansion.

So I say that this program to spread Procurement, far from being a thing that will slow down the Defense Program, will speed it up if it is effectively handled. It is true that the benefits to the Defense Program are there in the long run as well as the short run. We know during the last war, when the Military demands grew far higher than they are at the moment that those increasing demands were increasingly filled by small business in both England and this country. As the requirements rose, the importance of bringing in small business rose likewise.

Now to come to the program—what we are trying to do about it. I am only going to deal in detail with one phase of it, because you gentlemen and ladies are mostly concerned with Procurement and contracts, rather than some other phase of what we do, and I want to stress the Procurement angle, which is, in any event, the most important part of our program.

Our general approach to this whole question of small business and Procurement is a very simple one. This is not like the old days, when government procurement was a very small percentage of the total economic picture. When we have this situation, with a large share of the market being pre-empted by government buying, then we must have a plan, the principles to carry it out, to see that whole geographical areas, whole industries and whole segments of the economy, such as small business, do not get overlooked.

That general objective is not a new one. You are all familiar with it, and before this new agency came into existence, a number of things had been started and undertaken to try to bring about this spreading of defense work. Clinics have been held to try to bring Procurement opportunities to small business. The Department of Commerce has been publishing synopsis information about wars, and the Department of Commerce has been rendering technical aid in a number of ways. All of those things have been done, all of them are good and should be continued. But the basis for our existence and what Congress specifically had in mind was to go beyond those measures that have been taken up to now and do something which will counteract this terrible push toward the big companies, based on the nature of the product being made, and try to insure that small business gets all it can handle. And the program of coping with it, as outlined for us, is basically similar to what was done during World War II, by war plants' cooperation. There is nothing revolutionary, there is nothing particularly new, in this program. It is fundamentally a revival of what was once before found to be practical.

The primary setup of our program is simply this, as the statute of setting us up provides: Opportunities for government procurement will be reviewed before any decisions are made as to how they are to be awarded, and those opportunities which it is plain that small business can handle will be earmarked and so handled in the awarding so that they, in fact, go to small business. That is all set forth in one of the Sections setting this up, and that is the program which we have been working out with the Armed Services Procurement Authorities.

The basic directive to execute and carry out this program of earmarking contracts was embodied in a general directive published by the Department of Defense for the end of March this year. The program embodied in that directive is fundamentally what I have just described. Representatives of Small Defense Plants Administration will sit in the Government Procurement Offices on an elbow to elbow basis with the Procurement Officer and review these opportunities. If small business is equipped to handle them, they will be earmarked by means of what we call a "Joint Determination." This means both the Procurement Agency and our Agency will jointly determine what small business is equipped to handle, and once such a thing is agreed to, the contract will be placed by negotiation with small business and small business only.

This does not mean the award is going to be made in any closed corporation fashion. We will use the techniques of advertising to make sure that the competition among small business is as wide as possible, but the competition for that award will be restricted to small business.

This directive embodies one further thing. If the Procurement is of the kind which the Armed Services have traditionally let by open advertising, as soft goods, for instance, then the Procurement Agency and our agency can agree by joint determination that a specified percentage of that procurement will be advertised and the balance will be withheld from advertisement and awarded subsequently to small business.

That is the gist of the policy and the directive that Congress prescribed and we worked out with the Procurement agencies. The directive, which I mentioned, published by the Department of Defense, left it up to the three Services individually to work out instructions in detail to carry out this program. In a matter of two weeks or so, after the Department of Defense directive was issued, early in April, the Air Force issued its own directive, putting all of that into effect. Since early this week our representatives have been at Wright Field and they have commenced the operation of this program. The comparable directives to be issued by the Army and Navy have not yet been issued, much to my regret. I feel Procurement authorities in both the Army and Navy have been dragging their feet in putting this directive into effect, and I think it is particularly unfortunate that this long wait has ensued because, in the meantime, this downward trend of the small business share has continued. I don't think there is adequate reason for delaying putting this in effect, when the trend is in that direction.

I want to interject at this point and say I am well aware that the small business record of the Chemical Service stands out in very pleasant relief to the record of some of the other Services. The figures I have given for the share that small business is getting from the Services as a whole are far under the share that small business gets from the Chemical Corps.

That is the beginning of the program and the essence of it is this earmarking process. That process is supported by two other things, which I think will be of value. The S.D.P.A. is authorized to certify that a given small business is competent both as to technical capacity and credit to perform contracts. Once that certification has been issued the Procurement Agency cannot refuse to award the contract of that business on either of these grounds. They may turn them down on the ground of price, but cannot reject the company on the basis that they are not equipped to perform the contract; and, finally, this process is further supported by our loan functions. Companies which are receiving defense contracts can come and apply for a loan from the R.F.C. on our recommendation, for working capital, equipment or other things needed to carry out the contract.

I want to again inject at this point that we are in the inception of establishing a small field organization to carry out these activities, and we have established a regional office here in Chicago, of which Mr. Brenelson is the Regional Director. If anyone is interested, either yourselves or someone else, in getting the details about these loan procedures or any other phase of it that I have mentioned, he will be only too happy to assist you.

In the sub-contracting field (and time is only going to permit a few words more on any one of this), we have no such specific statutory policies that we have on prime contracts, but we are there going to apply, again, the same kind of thing. The representatives in our agency working with the Procurement Agencies are going to identify those portions of the large prime contracts which can be given to the small business and there will be a greater spreading of those portions of the prime contracts to small business.

We have recently taken one effective step to promote sub-contracting. The government renegotiation has been amended so sub-contracting will not operate at a disadvantage, if your contract is renegotiated, but rather at an advantage.

In conclusion, I want to stress that Congress has not set us up as a direct operating agency. We don't make the loan and we don't let the contracts. Those things are done by the R.F.C. or the determining agency, and, therefore, these provisions and programs that Congress has called for here can only be a success if we have the highest degree of inter-agency cooperation between ourselves and the R.F.C., the Procurement Agencies and the national Production Authority. And that is one reason why it is an especially welcome opportunity to speak to this organization that has so many Service members in it. It gives me hope that we can look forward to a very pleasant association which will be beneficial to the economy as a whole and small busines in particular.

Just one other thought in conclusion, I was much interested in what General Bullene had to say about the destructive effects of certain kinds of warfare, and how he very eloquently pointed out that it is no longer sufficient merely to win a war. It is much more a question of how you win it and what you achieve by it. We have heard a lot of talk about "winning the war and losing the peace," and I think basically what your agency wants to do is insure that in the process of preparing for war we don't at the same time destroy the things we are trying to protect.

There is no reason, if this program is properly planned, why it can't be effectively carried out, and still maintain the traditional place small business has in our total economy. In fact, the program won't be as well carried out, unless it does maintain that place; and, in fact, unless that place is maintained, it may not be worthwhile to carry out the program at all.

QUESTIONS and ANSWERS

"Quiz Kids," Gen. Creasy, Gen. Black, Adm. Bolster, Col. Johnson and Mr. Taylor answer questions at sessions of the Chicago Meeting.

QUESTION: In an overwhelming surprise attack on Western Europe, isn't it possible that friendly capitals and industrial areas would be occupied so that strategic bombing would be difficult, and irreparable damage to our position done before the limitations in Russia's economic potential would be exposed?

COLONEL JOHNSON: Is General Bullene present? That is a very interesting question. That is one that naturally receives lots of attention. However, all the documents pertaining to that particular question which I receive are marked "Top Secret," so I don't believe I can give any information whatsoever, although it is being given a great deal of thought.

QUESTION: If a manufacturer accepts a government contract and then loses money to complete it, is there any procedure that such a manufacturer could use to obtain an adjustment so that he would be paid for at least his material and labor costs?

BRIGADIER GENERAL BLACK: There are several answers to that. Except in a strictly advertised contract, there is usually a price adjustment clause, which, for the protection of the Government, can be 100 per cent down and 15 per cent upward. Virtually every contract is audited today, and if there is a justifiable increase in cost it may be covered under that 15 per cent upward adjustment.

The second that I can think of quickly is, there is a Contract Review Board in the Office of the Secretary, and if your case —without going into details—is one that merits such consideration, that Board can allow, under certain circumstances, adjustments to partially or wholly remove that loss.

If you do a bad job or make a bad guess on your costs, there is nothing that will absolutely guarantee that you are always going to be brought up at least to the point where you have no loss.

QUESTION: How can local Civil Defense Agencies obtain information on BW to permit protective instruction and planning? Must we rely exclusively on the Federal Civil Defense Administration, or can we get assistance directly from the Department of Defense?

BRIGADIER GENERAL CREASY: To the first question, must we rely exclusively on the Federal Defense, or can we get assistance directly from the Department of Defense, the answer is no. We keep in close touch with the Federal Civil Defense Agency and we furnish them all the information we have, including the Top Secret base. This is then screened out into a form useable by the Agency, and from them going to the local, state and other Federal Defense organizations requiring information.

Obviously, it would be entirely impractical for the Military establishment to attempt to deal directly with the hundreds of municipalities that are interested in this problem.

QUESTION: How does a small manufacturer go about getting the Procurement District Office to inspect his facility with a view to handling a contract or a sub-contract?

BRIGADIER GENERAL BLACK: As to a contract, the best answer I can give you is to go to the District Office and sell yourself to the District Procurement Officer. You have an obligation to sell. The Districts are busy. We are understaffed, we have a limitation on the people we hire. You have to allow some judgment to the District Commander as to his needs, and he can't go out hither and yon for everyone who could come in. It must be something he needs in order to inspect a facility.

QUESTION: At the time that a military procurement is established, is there a coordination with C.M.P. as to the availability of materials for such a contract?

BRIGADIER GENERAL BLACK: Very definitely, when the materials needed are controlled items. Naturally, we don't go up on the free items and there are not too many controlled items at the present time, but we must get allocations in advance—as much as six months in advance in our steel. We have, in my office, and the Chief has in his office, individuals assigned as C.M.P. officers, whose constant duty it is to have contacts on these matters. So there always must be coordination if the item is controlled.

QUESTION: On all government bids, it states that delivery must be within a given number of days. What happens if the delivery is not met because of a strike-bound plant or failure to meet quality standards?

BRIGADIER GENERAL BLACK: There are two questions there.

In the first case, it is rather difficult to state; whether it is an Act of God or a union or some other excuse for delay, in each case you have to go back to the Comptroller General's decision.

I remember one case several years ago, where there had been a terrible flood in the Louisiana area and a man was not able to fulfill his contract for supplying lumber. The General Accounting Office was asked for a decision, and their decision was that we expected to have floods at that season, and the fact that this one was a little worse than usual was not an excuse, and the man was put in default and the Army bought his account and he had to pay the difference.

The second part of your question in regard to failure to meet quality standards, the general answer is if you fail to meet the standards, whether it is quality or what have you, the Government has the right to put you in default. That is, if it is a firm price contract, you pay the difference. If it is a negotiated contract, or on a cost plus fixed fee basis, the Government fixing the contract, the Government pays. That is why I don't like cost fix contracts.

QUESTION: Who is the proper party or parties to contact regarding Research and Development Contracts on metal parts for chemical warfare?

BRIGADIER GENERAL BLACK: May I answer partly for General Creasy and partly for myself.

General Creasy's organization decides what they want. They may indicate to us who are the procurement sources. If they can certify to the acceptance of the contracting officer that that must go to a single source, we will do that; otherwise it is our job to find the sources to supply it. So it depends on the case. You may want to contact his project officers to see if you have something to sell them to meet some requirement of his, but you can also contact our procurement agency at Edgewood as a reliable source to tell you what you can do in case they are looking for sources.

QUESTION: Do you feel that all small business firms should spend their time and effort on sub-contracts?

BRIGADIER GENERAL BLACK: If you could divide me in enough parts to be part of the organization of all subcontractors, I might be able to tell you which ones should and which ones should not. It has been my general experience, in having people come to me, that there are usually numerous subcontractors looking for work and they can't get it, and it means we just don't have enough contracts from our primes to satisfy the ten, fifteen, or twenty or fifty who are looking for work. I think the only way you can make that judgment is, can we keep in business with our commercial business or must we go to the Government for business? I just know we cannot support all small contractors.

QUESTION: Will the government help small business to obtain critical materials? Over what period will small business be allowed to amortize their installations?

MR. TAYLOR: Yes, of course, we do help small business to obtain critical materials. The principal way we have done it is to establish, in cooperation with the National Production Authority, a special reserve of metals, which is available to small businesses which are primarily dependent upon continued access to the particular metal in question. For instance, we will take the manufacturer who makes aluminum crates and has only that line of business, and who has been cut way back on aluminum. He can, by showing he is a small business and entirely dependent on this line of work, get access for relief through this pool.

The second part of that question was "Over what period will small business be allowed to amortize their installations?" I suppose the answer to that must await the tax amortization period, and I should like to point out that we have a program on foot with the D.P.A. to insure, out of the total amortization certificates granted, that small business gets a share roughly equal to the pre-Korean share of industry as a whole.

QUESTION: Will any special provision be made for the small business that is already approaching a distress condition?

MR. TAYLOR: There has been no special provision made, but all these things I have discussed, Procurement, the help on materials and financial assistance, are available and, of course, we will try to utilize all those things where the need is greatest.

QUESTION: Will small business be defined more accurately than it is today? That is only on number of employees?

MR. TAYLOR: Maybe a few words on the definition is in order. The Army and Navy and Air Force have traditionally used this test on employees—500 or less, but the statute setting us up does not use that alone, but whether a business is independently owned, volume of business, as well as number of employees. I do not think, except in a few instances, this question of definition has yet become a critical one from an operational standpoint, but we have had some tough cases.

QUESTION: I would appreciate further clarification of the manner in which a small business can obtain the necessary financing for a government contract. It appears that at present, should a small concern be the successful bidder, too long a length of time is taken by present procedure.

MR. TAYLOR: You can get further details from our office here, but the direct answer is this: I don't think we are going to have sufficient expedition in the granting of contracts until we have decentralized the authority to make loans up to a given amount. You may recall the R.F.C. had that authority up until last year, and it was withdrawn in the field offices and redelegated it back recently. We will also delegate to our office the authority to approve loans to a given amount as soon as we have the staff trained and equipped to handle it. I think decentralization will accomplish the speed.

QUESTION: Should a small manufacturer with a real plan for rendering a very definitely needed service for all of the Services submit this plan directly to the Small Defense Plants Administration, or to the Service that would most likely benefit? Keep in mind this, if accepted, would entail expansion of the machinery.

MR. TAYLOR: I don't think there is any definite answer to that. I think you can go to either place or both places. This is a thing that has to be worked on, not out, in a technical way and fitted to the Service. It then becomes a matter for negotiation for a contract. I suggest you come and see us about it.

QUESTION: In the event of a contract being awarded to a low bidder, is consideration given to see that he has some profit to take care of unexpected emergencies, rather than have such a contractor request renegotiation?

MR. TAYLOR: I think maybe one of the gentlemen from Procurement can answer that more specifically than I can. I can only say in our program this factor has not played a part.

QUESTION: In the interest of economy, why aren't small business specialists transferred from the Armed Services to Small Defense Plants Administration along with the appropriation originally provided for this service?

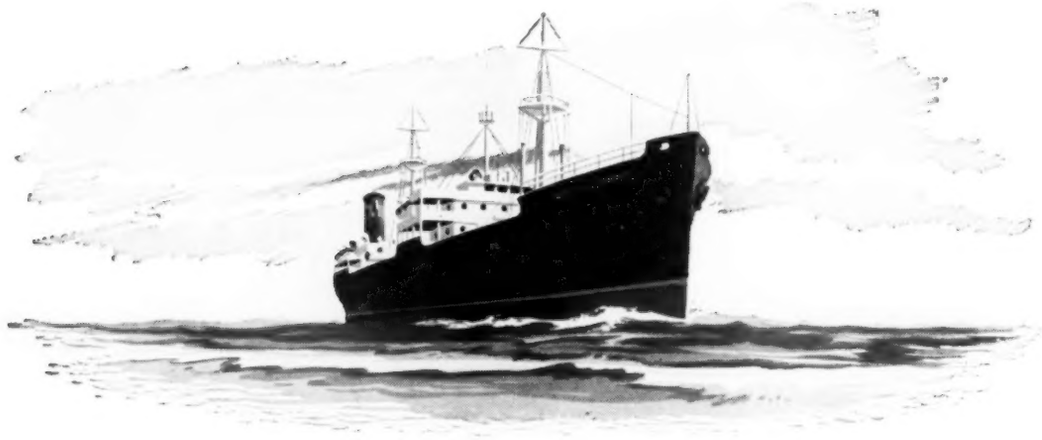
MR. TAYLOR: In the interest of economy alone that might be a good thing. However, there are several things to bear in mind. The small business specialists now in the Armed Services have built up inventories, contracts, contacts and so forth, which would be a very unfortunate thing to lose. I might say, this whole question of the staff of S.D.P.A. and the staff of Procurement agencies in Commerce is undergoing some study by the Bureau of the Budget, and maybe we can have a more specific answer to that some day.

QUESTION: Who is going to conduct surveys to certify small businesses?

MR. TAYLOR: The survey must cover credit in technical capacity, and our credit surveys, especially in the field office, from the industrial and from the capacity standpoint.

(Continued on page 51)

New developments at DOW



MAGNESIUM goes to sea to fight costly hull corrosion

Magnesium, the light weight metal that's helping U. S. airplanes fly further and faster, is now performing an important task at sea . . . combating hull corrosion.

Magnesium anodes have been installed for the first time on a large American commercial vessel, Dow's "Marine Chemist". This 13,000 ton leased tanker is used by Dow to transport chemicals from its Freeport, Texas Plant to the eastern seaboard. The magnesium anodes protect the hull from corrosion by an electrochemical process known as cathodic protection . . . a process which has proved successful in underground tanks, pipelines, and industrial equipment.

Hull corrosion is caused by small electric currents flowing through the sea from the more active to the less active parts of the hull, removing hull particles from the active areas. Stopping this flow prevents removal of hull particles and that's where cathodic protection comes in.

When magnesium anodes are installed on the ship's hull they become the most active area of the hull. The current flows from the anodes so only they are corroded and they can be replaced at low cost compared to repairing a ship's hull.

It looks as if cathodic protection, which has been used successfully by our Navy on its "mothball" fleet, has a bright future on sea-going vessels, too. For this electrochemical process promises to save shipowners millions of dollars a year in money and time.

Magnesium anodes are made by Dow, a pioneer in magnesium development and production, and a major supplier to the armed services as well as to private industry.

The magnesium anodes shown here being installed on the "Marine Chemist" are about 16 inches in length and weigh 60 lbs. They were designed to last a year.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Requirements for Better Weapons

By
SECRETARY OF THE NAVY DAN. A. KIMBALL

Address by Secretary of the Navy Dan A. Kimball, before the Armed Forces Chemical Association Annual Meeting, Chicago, Ill., May 16, 1952.

I am glad to have the opportunity to talk with you here tonight for several reasons.

The first and foremost reason is that I feel very strongly that you gentlemen of the Chemical Industry and the Officers in the Services who are your points of contact, loom more important today than ever before. The Army recognized that the narrow connotation of the words "Chemical Warfare Service" had been out-paced by scientific developments in the broadening field which was being dealt with.

I note from an article by General Loucks that he observed that the toxic agents that might be used in any future war compare to those used in the First War as the Model T Ford compares with a modern, high-compression engined automobile.

There was no large-scale use of poison gas or other toxic agents during World War II. For this we can be very thankful, but it was not, as you know, sheer luck which spared us the horrors of toxic warfare.

When the Japanese were reported to be using gas warfare against the Chinese, this government warned the Japanese that the use of gas against any of the allies would be considered as chemical aggression against all of the allies.

There was no luck factor, I repeat, because the most probable reason for restraint in the use of gas was based on our ability swiftly to retaliate with similar weapons. Therefore, we cannot ignore the potentialities of this sort of warfare in some future aggression. It logically follows, therefore, that—unpleasant as it may be to contemplate—we must prepare similar retaliation for use in any war that may come.

Widespread propaganda attempts have been made recently within the Iron Curtain countries in this connection. The baseless charges that we have used toxic biological agents in Asia have been in the familiar Soviet pattern.

Any rational person who knows anything about the United States is certain to reject these charges for what they are—rubbish.

But, the Communist scheme does not produce rational persons. The outpourings of their propaganda mills are known to reduce rational persons, even people of extraordinary intelligence. The robot of this debased level of human existence—the victim—becomes a mouthpiece for this baseless propaganda, and in the advanced stages of degeneration can be made to believe whatever he is told.

We have taken the steps necessary to refute these allegations. We will continue to show them to be the calculated lies which you and I know they are.

Free people everywhere are being reminded that this nation does not do business with poison, and we are reassuring them that this nation will never make war with poisons or similar weapons unless forced to do so in retaliation for similar attacks from some unscrupulous aggressor.

* * *

Most of you, I suppose, are aware of the keen interest I have maintained through the years in research and development.

The industry you represent is one that we look to in large measure for basic research findings upon which to base new developments in many fields related to the defense effort.

Time will not permit me to deal with all of them, of course, but since one of my primary interests has long been in the development of better power plants for aircraft, rockets and ships, I should like to mention a few items upon which we need continuing research development and technical assistance.

The new power plants which we are developing create tremendously high temperatures. We know that we will probably continue to raise our operating temperature conditions in boilers and gas turbines as we progress in the search for higher efficiency and greater output in horsepower or thrust.

To achieve these desired ends, we need to find a way to eliminate slagging and the ash corrosion which results from the use of residual fuels. Industry has already been of great assistance in attacking this problem, for which we are appreciative, but we need continuing help.

In the field of propellants, public discussion is difficult because of the security classification of much of the data.

It might be interesting, however, for some of you who have not had contact with this field to know of the general objective which we seek.

In this connection, I mean liquid or solid materials which, by rapid burning or reaction, release large amounts of heat energy which can be translated into useful work.

A number of liquid propellants have been brought to the point of practical use, but we *seek* better ones because we *need* better ones.

In our attempts to develop newer and better solid propellants, we have the same standards, roughly, as with the liquids. In this field, some of the most pressing problems are those of getting solid materials which have the proper physical properties to withstand storage under all expected ranges of temperature. They must also have the stability to withstand handling, acceleration and firing without developing faults.

We of the Armed Services realize we must provide directly

for most of the research and development which leads to better products in this field.

In the past, I have battled unrelentingly for adequate appropriations for research and development, and I will continue to do so.

I am convinced that the wars of the future will, in large measure, be won in the laboratories of today.

The requirements for new and better weapons are going to continue to press themselves upon us. Therefore, we cannot stand still, nor would we, unless we be fools, try to turn back the clock.

I should like to remind you that it was just 10 years ago last week that the Battle of the Coral Sea was fought. It was the first engagement in naval history in which the ships of the opposing force never came within sight of each other.

That battle was an historic milestone. From that day on, we realized that development of sea power lay in the direction of what we call sea-air power.

The aircraft carrier has supplanted the battleship as the Navy's capital vessel. The battleship, however, was not outmoded or rendered obsolete, or even obsolescent, by the development of this new doctrine.

Nor did the battleship and other surface forces become merely supporting elements. They are integral parts of the fleet. The carrier is the heart.

Carrier aircraft extended the range of naval gun fire from a mere 20 miles to a radius of 600 miles. This range is due to be even more widely extended when we receive the newer planes which we have on order today.

Aviation developments have overtaken the built-in stretchability of our present aircraft carriers. The transition toward heavier jet and turbo-prop aircraft has required us to design larger carriers, with stronger flight decks and increased storage for plane ammunition and aircraft fuel.

We have one of these large carriers now being built. We have asked Congress for the money with which to build a second one. Thus far, this money has been refused.

We cannot continue the orderly development of adequate naval forces if we cannot have the ships from which to launch the larger aircraft needed to maintain the sea power necessary to control the oceans.

The capabilities of carrier task forces to maintain control of the seas will probably be best demonstrated to you gentlemen of scientific and mathematical accomplishments by the use of a few statistics. Let me establish first for you the composition of a carrier task force.

It is composed, ideally, of 4 aircraft carriers. These carriers have a total of 440 airplanes of all types. Accompanying the 4 carriers in this ideal force about which we are talking, there would be one battleship, 3 cruisers and 24 destroyers. The crew and air groups of the carriers would total 11,000 men; the crews of the accompanying combatant ships nearly 13,000 men, making a total of about 24,000 combatants on the carriers and accompanying ships.

Under wartime conditions, every one of these 24,000 men is a combat effective. Every man on every ship has a battle station and is trained to play his part on the sea-air power team.

In the air groups alone, there would be a total of 2,900 officers and men. These 2,900 officers and men—pilots, air crewmen, crew chiefs, flight deck crews and miscellaneous personnel—are capable, with their air groups, of delivering on targets during a one-day period 1,000 tons of bombs or 5,000 rockets at short ranges such as in close air support and interdiction operations of the type the Navy is now charged with in Korea.

At ranges which might be expected to be flown in penetration strikes—usually up to 600 miles radius—these air groups can deliver 300 tons of bombs or 2,000 rockets.

At comparable ranges, this force, under sustained combat conditions, is capable of delivering bombs on targets at the same rate as was achieved by the German Air Force during its peak effort against England in September 1940.

At that time, the atomic bomb was not a reality.

It is today. The Navy has participated in its development and refinement, and the planes of a modern carrier air group can deliver the A-bomb, if directed to do so, at ranges comparable to the distance it can carry the more conventional bombs and rockets.

The 24,000 men of this carrier task force, including the accompanying vessels, need, not only beans, bullets and bombs, but also other items from the 370,000 items of general supply which we ship to our fleets wherever they operate.

This is why we have a service force.

The task of the service force is logistics, a five-dollar word, if ever there was one, to describe the business of supply.

We in the Navy feel we have worked out this supply problem with a maximum economy of supply ships and personnel. The tankers, supply ships, ammunition ships, and accompanying destroyers to protect this service group are manned by a few more than 3,000 men.

The 3,000 therefore feed, clothe and supply everything for the 24,000. If you will have any sons or relatives in the Navy, I am sure they will tell you that they do it very well.

With multiples of carrier forces such as I have described to you, your Navy is prepared to meet any challenge which may be made against our command of the seas.

Important, however, in addition to the mobile striking forces, are the specialized forces we would need to meet and defeat the submarine menace. The Soviet Union today probably has something more than 300 underseas craft of various types. This is a formidable force in itself and many times the number of submarines the Germans had in commission when World War II began in 1939.

Command of the seas, therefore, means not only control of the surface of the oceans, but control beneath the seas, as well as in the air above it.

Strong naval forces are powerfully persuasive in the United Nations' effort to deter aggression and prevent the spread of the present fighting, or new outbreaks of Communist aggression.

Our Sixth Fleet today is a strong force for peace in the Mediterranean world. Our Seventh Fleet in Korea is contributing effectively to the support of United Nations troops in Korea and is, at the same time, maintaining the security of the Western Pacific. It is only through the maintenance of this security that we can assure the safe transit of troops and the supporting of the forces already in battle in that unhappy country.

We have, therefore, two working examples of the capabilities of sea power.

Sea power alone cannot either prevent war from breaking out in Europe, the Middle East, or North Africa, nor can it win the war already being fought in Korea.

However, I want to emphasize this point: without adequate sea power in the Mediterranean, war in that area of the world could become much more a distinct possibility and without sea power the United Nations could most surely lose the battle for Korea.

Much remains to be done abroad as well as at home.

While we actively pursue efforts to conclude, in a peaceful fashion, the many negotiations which we are currently conducting, we need to be strong within, and among, ourselves. We need a renewed national unity in support of our own rearmament program as a demonstration and evidence of good faith in our allies abroad who we have asked to expend, in proportion, even greater sums than we are spending to make ourselves strong.

We cannot, with any hope of success, sit behind the natural barriers of two broad oceans, and say to our allies abroad in

(Continued on page 49)

WITCO *steps up production* to meet vital defense needs

with new manufacturing facilities . . .

In Chicago, Ill., Witco's expanded facilities have more than doubled production of Napalm and other vital chemicals.

In Lake Charles, La., Witco-Continental's new plant, capacity 25 million lbs. a year, is in full-scale production of High Abrasion Furnace black.

In Sunray, Texas, Witco-Continental has substantially increased its facilities for production of Semi-Reinforcing Furnace black.

with new research laboratories . . .

In Chicago, Witco has added a two-story wing to its research and technical service laboratory. Work will be carried out on a variety of important organic chemicals.

In Amarillo, Texas, Witco has opened a new laboratory devoted to research and technical service on carbon blacks.

All Witco facilities stand ready to serve the vital needs of defense, in production or in research. Inquiries will receive prompt attention.

A few of Witco's products meeting government specifications . . .

Napalm (JAN-N-589)
Aluminum Stearate (MIL-A-15206-Ships)
Barium Stearate (JAN-B-366)
Calcium Stearate (JAN-C-263)
Magnesium Stearate (JAN-M-542 Ammunition) (JAN-M-560-Ointment)
Lead Stearate (for ammunition) (JAN-L-758)
Copper Naphthenate (for many mildewproofing specifications)
Drier, Paint, Liquid (TT-D-651a) Type I and Type II
Drier, Naphthenate, Concentrated, Liquid (Navy 52-D-7) (AN-TT-D-643) Type I, Lead 24%; Type II Cobalt 6%; Type III Manganese 6%; Type IV Zinc 8%
Linoleate, Manganese (MIL-L-15188-Ships)
Resinate, Calcium, Type I (USA-50-11-896)
Resinate, Manganese (Navy 52-R-8a)
Resinate, Sodium (MIL-S-6138-Aer.)
Zinc Naphthenate (for use in Army Spec. AXS-1296) (52-D-7 Navy) (AN-TT-D-643)
Wood Preservative, Copper Naphthenate (52 W 5 Type A)
Carbon Black, Dry (for explosives) (JAN-C-306)
Case Liner Adhesive (JAN-P-140, Type II, Grade A)
Paint, Acid Proof, Black (for ammunition) (JAN-P-450)
Composition, Top Coating Material Bituminous (JAN-P-102)
Compound, Chassis Coating (Army AXS-1827)
Compound, Protective Strippable (Army AXS-1756)
Compound, Rust Preventive Thin Film (Army AXS-673)
Compound, Sealing, Dipcoating (JAN-P-115)

Also Asphalt and Asphalt Compounds meeting Military and Federal Specifications

WITCO CHEMICAL COMPANY
DEFENSE PRODUCTS DIVISION
75 East Wacker Drive
Chicago 1, Ill.

The Chemical Industry AND NATIONAL DEFENSE

By H. A. KUHN, Colonel, U.S.A. (Ret.)

For the past one hundred years the chemical industry has expanded most rapidly in time of war. This is a firm indication of the vital role of the chemical industry in National Defense.

At the beginning of the Civil War our chemical industry was small—today we produce in less than two hours the total production of 1860. However, during that war chemical production expanded 500 percent. Fifty years of steady peacetime growth to 1914 laid a firm foundation, for our next wartime expansion.

Some of you here remember the shock to our economy when, in 1914, the outbreak of war in Europe cut off imports of dyestuffs, potash, cyanides, medicals, and a host of organic chemicals. In addition, the introduction of chemical warfare as a major weapon in World War I was a direct challenge to our chemical industry, and how well they met it was indicated by the fact that at the end of World War I our production of chemical warfare agents was four times that of Germany and approximately equal to the combined production of France and Great Britain.

The chemical industry more than tripled from 1914 thru 1919 and became big business. While this mushroom growth slumped briefly after the war we began to build the integrated chemical industry which in the next twenty years of steady expansion, 11 percent annually, made us chemically independent of the world by 1939.

We could not have fought World War II without the new chemical productions of the preceding years—synthetic phenol, dyestuffs, alcohol, potash, synthetic ammonia, methanol, nylon, ethylene glycol, petrochemicals, and a host of other synthetics. In 1939 the production of the chemical industry for the first time entered the billion dollar class.

Despite this tremendous peacetime capacity, World War II speeded chemical expansion by 300 percent in the first four years. Both the military and industry realized fully at the beginning of World War II that the chemical industry was the foundation to military expansion in every field from the basic equipment of the soldier to the most complicated fire control instrument, battle ship and airplane. While centralized planning and procurement of chemicals by the military services was obviously desirable, it was never achieved during the war. The nearest approach was the central chemical procurement of the Chemical Corps where a number of chemicals common to several services were purchased. This agency in its limited field bought more than 300 different chemicals, none in the explosive or heavy tonnage field, totaling almost a billion pounds for use in government *owned* plants. The scope of their purchasing is an index to the vital role of the chemical industry in war.

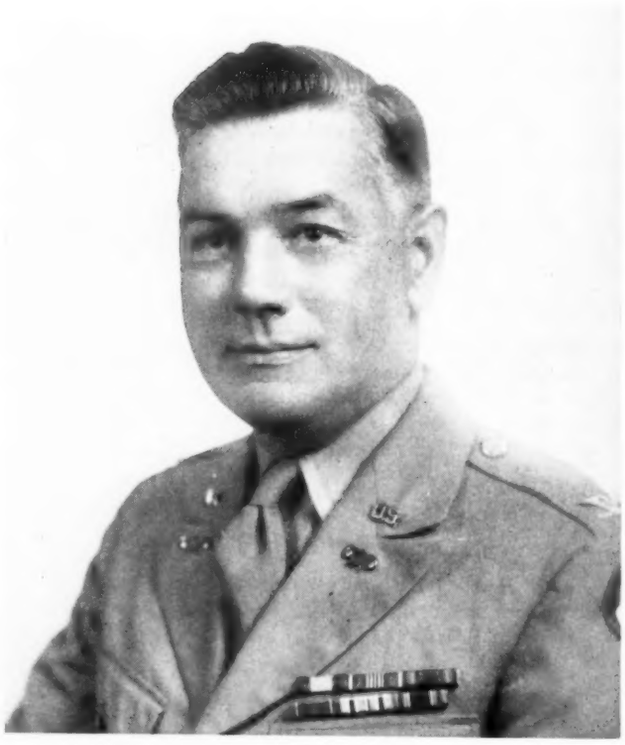


Chart No. 1 represents the average dollar volume increase in chemical production from the 5 million dollar output in 1859 to the 18.5 billion dollar output in 1951. The 1859 figure represents a handful of inorganics plus a few natural dyes, the 1951, many thousands of inorganics and organics totaling millions of tons. The basic figures come from the Bureau of the Census Reports, and while the value of the dollar has not been reduced to a common denominator the percentage figures, particularly in the war time period, are calculated on the year to year figures to minimize the effect of inflation. This chart emphasizes the tremendous increase in chemical production required to supply war time demands.

There is a basic difference between World War II industrial expansion and the present war expansions. In World War II the expansion was made with the tax payers money, while today it is being made almost entirely with private capital.

Delivered at the May meeting, Virginia Section, American Chemical Society at Hopewell, Virginia.

Of the more than 23 billion dollars in industrial expansion made from 1940 to 1945, 17.2 billions was made with public funds, and about 6 billion with private funds.

In the current war accelerated tax amortization certificates have been issued by the Defense Production Authority for projects estimated to cost 20 billion dollars with almost 10 billion in applications pending—a gross total of planned expansion by private industry exceeding in dollar value the entire World War II increase by both government and private industry. Contrasted to the government expenditure of more than 17 billions in World War II my guess is that at present the government, disregarding the money spent for atomic weapons, modernization of old plants and machine tools, is not spending more than 200 millions on new government industrial plants.

In World War II, chemical companies privately financed an expansion costing 2.31 billions. To date certificates of necessity have been issued for over 2 billions of expansion in the chemical industry. A recent survey indicated that the chemical industry is planning expansion in the period 1950-55 of more than 6.4 billions, half completed or underway. If a shooting war comes the chemical industry will be ready to furnish the basis for all-out military production.

With the full effect of the present military procurement yet to be felt, production of a few chemicals has jumped 100%, others 20 to 50% since Korea. The production of the entire industry has increased 20 to 25%. Percentage-wise the pattern of expansion is beginning to parallel that of previous wars. However, there is one factor in our present expansion which did not exist previously—the building of industrial capacity to support both a long military mobilization as well as a civilian economy, at a reasonable level. A major war will use all of this expansion and more. Lacking a major emergency our rising standard of living and increasing population will absorb this new capacity as it has in the past. The unexpected stretch-out of the military program may in the meantime give us some excess capacity in a few lines.

On the other hand no one knows how long this world crisis will last—five, ten or fifty years. In past history, wars involving conflicting ideologies such as the Crusades, the invasion of Europe by Genghis Khan, the Huguenot War, the "30 Year War" in Bohemia, have lasted from 30 to 100 years. In a broad sense Korea is just a phase of a war against democracy which began in 1914 and may well last as long as the Crusades. (100 years.)

I will not attempt to cover all of the hundreds of chemicals essential to national defense, nor even the 50 or more chemicals being expanded by tax amortization. I will discuss briefly a few basic chemicals of major importance to war production.

CHLORINE, vital to our domestic economy as well as war, comes first to mind.

Chlorine was the first "war gas" used in modern warfare, and when we entered World War I one of the first government built plants was a 50 ton chlorine plant at Edgewood Arsenal, Maryland. In World War II the government built six chlorine plants with a capacity of 925 tons per day. All World War II government plants were leased or sold for civilian production after the war, and in addition the industry had expanded its capacity more than 50% by the outbreak of war in Korea.

But despite the expansion of 1000% from 1930 we immediately were short of chlorine in 1949, and one of the few chemical plants built by the Army in the past year is a 225 ton chlorine plant. The industrial capacity is being expanded from 6000 tons per day to about 9300 tons per day, much of it to be completed this year. With present and planned expansion our capacity in 1955 will exceed 10,000 tons per day and will probably reach 13,000 tons per day by 1960. Despite the high capital investment chlorine remains one of our cheapest basic chemicals and is vital to our entire economy. Salt is one of the domestic raw materials with a proven reserve of thousands of years, hence the expansion is on a sound basis.

The sharp increase in chlorine production beginning in 1939 with planned expansion to 1955 is shown by Chart No. 2.

Several new factors in the chlorine industry might be mentioned. Prior to World War II there were only two commercial mercury cell chlorine plants in the United States, although in Germany the mercury cell began to replace the diaphragm cell rapidly after 1936. In the present expansion, including the government plant, at least nine mercury cell plants with a capacity of over 1000 tons per day have been, or are being, built. In Canada chlorine capacity has been doubled since the war, all using mercury cells. The principal advantage of the mercury cell is that it produces very pure concentrated

Chart 1

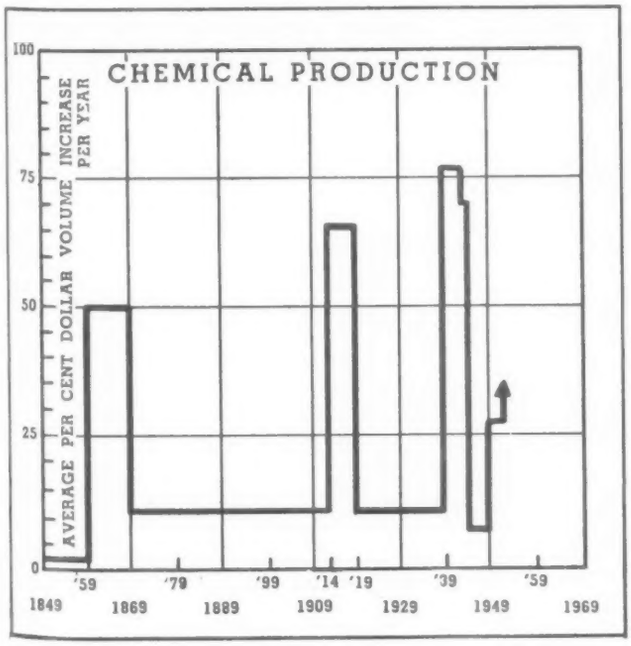
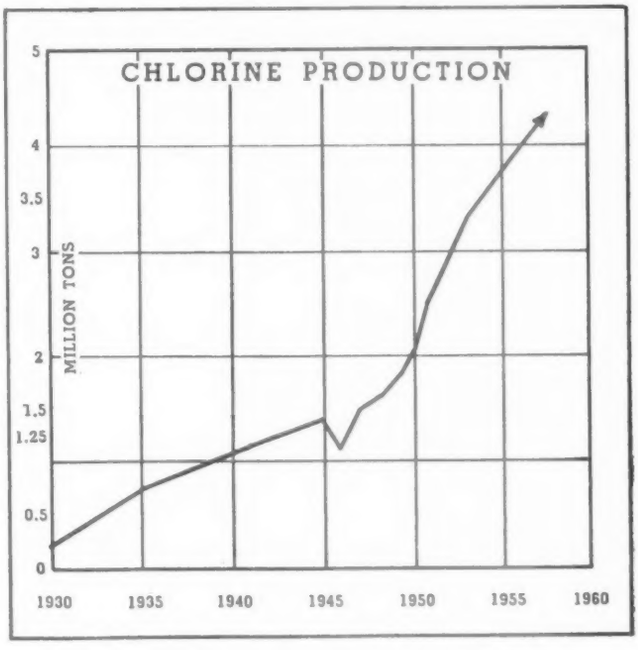


Chart 2



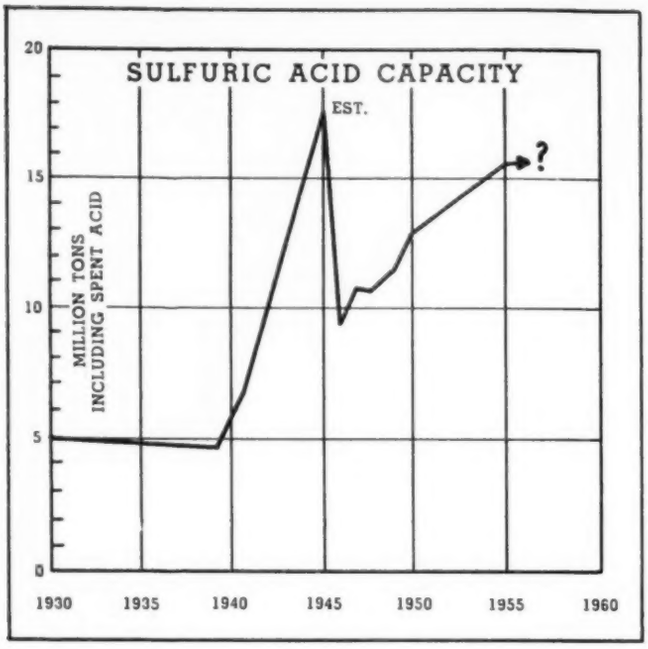


Chart 3

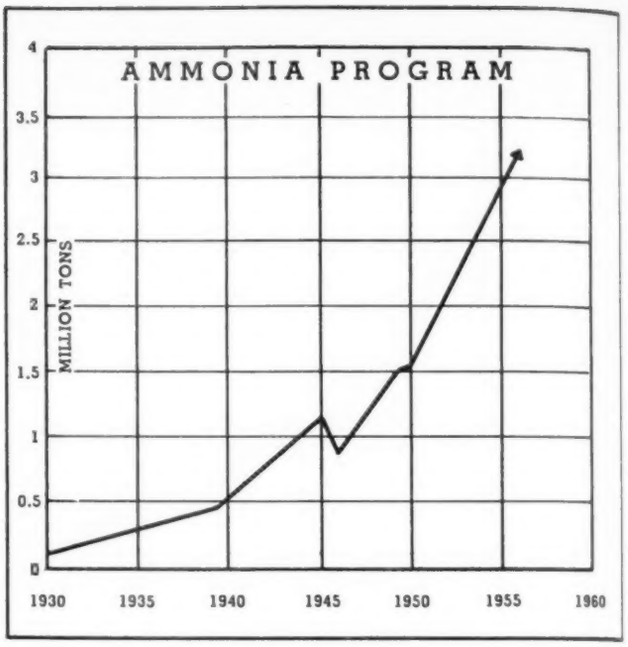


Chart 4

caustic soda without further purification or evaporation. From a military standpoint this is a saving in both labor and fuel.

A very recent development which may increase the available chlorine, where there is a very cheap by-product hydrochloric acid from organic chlorination, is being demonstrated in the plant being built by Hercules Powder Company at Brunswick, Georgia. This process, brought to a commercial stage by the Western Division of Dow Chemical Company at Pittsburg, California, involves the production of ferric chloride from ferric oxide, and hydrochloric acid with subsequent liberation of chlorine by oxidation. It is understood that Dow operated a pilot plant of one ton per day by this process, and that the Hercules plant, of about 35 tons per day, may be the forerunner of others. With the prospective surplus of caustic soda from the planned chlorine expansion any production of chlorine without the corresponding production of caustic soda such as via nitrosyl chloride, the sodium cell, or by oxidation of chlorides, is of major interest to the industry.

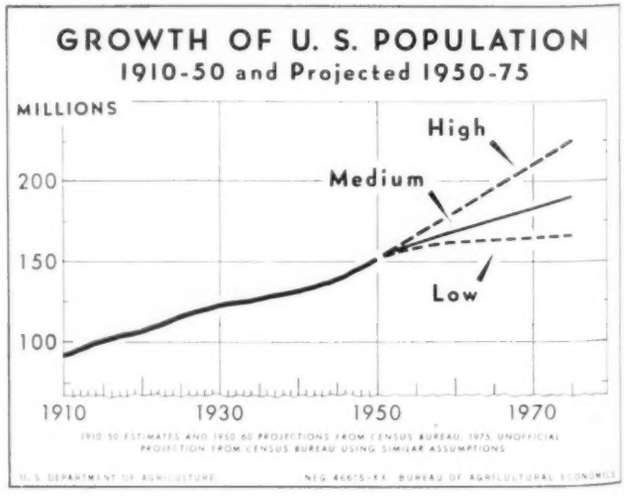
Another chemical basic to our entire industrial structure is *SULFURIC ACID.*

The sulfuric acid industry is one of the oldest segments of the chemical industry and 150 years ago we had at least three plants in the U. S. Its production curve has long been considered an accurate index of general business, entering as it does into every part of our industrial structure. Here the shortage is not due to a lack of manufacturing capacity but to a shortage of brimstone sulfur. The future may list brimstone sulfur among the first of our basic raw materials to be depleted, in this country. The discovery by Frasch of a very cheap method of pumping sulfur from the brimstone domes in Texas and Louisiana gave the U. S. practically a world control of sulfuric acid production, but it has resulted in depletion of our brimstone reserves, thought at one time to be unlimited. Today the whole chemical world is being forced to turn to other sources of sulfur-sour gas, anhydrite, and pyrites. These other sources plus possible new brimstone discoveries linked with conservation and efficient utilization will probably meet our sulfuric acid needs for some time to come. However, cheap sulfuric acid is probably gone forever and competition from other strong acids, such as hydrochloric and nitric, faces the industry in the future.

The sulfuric acid production Chart (No. 3) is based on the gross production figures compiled by the Bureau of the Census and includes oleum and spent acid, all reported as 100% acid. It has been difficult to secure exact data on the sulfuric acid capacity in the government plants during the war, and the production indicated is based on the best estimates available. The government oleum plants had a capacity of 865 thousand tons per year, and the total capacity of the light and dark acid concentrators was over eight million tons. With the possibility that a shooting war would add a sulfuric acid load similar to 1945, you can realize why the potential domestic and world supply causes grave concern, especially since the firm sulfur program for 1955 is 1¼ million tons short of the estimated demand.

AMMONIA is one of the chemicals common to both the military and food program. The full effect of this dual demand is yet to be felt but our production of ammonia is already almost double our combined military-civilian demand of World War II. The target production announced recently by the DPA of 2,930,000 short tons of contained N is an expansion of 1,390,000 tons over the 1950 capacity. More than half of the

Chart 5



expansion is now underway and certificates of necessity covering the balance have been issued.

The ammonia production Chart (No. 4) indicates the production of ammonia in tons of nitrogen both from synthetics and from by-product coke oven sources. The accelerated production beginning in 1939 and reaching a peak in 1945 was exceeded a few years after the war, 75% going into fertilizers. A major war, even after the planned expansion is completed, would result in curtailment for civilian use as new military uses, such as rocket fuels, make the potential military requirements very large. To meet fully potential military plus food production, estimated requirements might triple the 1955-60 target.

I have touched but a few of the many basic chemicals now under defense expansion. Eleven chemicals will be expanded from 100 to 300% of 1951 capacity. These expansions are in basic chemicals and in some cases for purely military use. The military end items are in most cases classified information.

FOOD is as important, if not more so, than munitions in our defense planning. This is not a new observation—for centuries European wars began after the crops had been harvested.

Food war planning today involves many more factors than just the removal of a labor force from the farm to military or industrial service. The enormous increase in mechanized farming eases that shock. Our population growth plus a high standard of living is out-stripping the natural food capacity of the soil. It has been estimated that to feed our annual net increase of 2½ million people each year requires food production equal to 7½ million new acres per year. We have just about exhausted our sources of new land and must depend on getting most of our additional annual production from old lands. (Chart No. 5)

The solution to food war planning is principally a chemical one as it involves restoring and increasing the productivity of the soil above even a normal level. This involves not only insecticides, defoliating, de-weeding, soil conditioning and soil sterilization chemicals, but also restoration of the chemical ingredients being depleted by crop growth or by erosion. At one time we believed that only six elements, nitrogen, sulfur, phosphorus, potassium, magnesium and calcium were needed in fertilizers. Today we know that boron, zinc, copper, manganese and molybdenum are also essential to plant growth and must be added to depleted soils. One of the biggest jobs of the chemical industry in national defense is to furnish the farmer the assistance to enable him to produce more food per acre despite the decrease in farm labor inevitable in war. Chart No. 6 furnished by the Department of Agriculture indicates in part the rapid increase in the use of chemicals on the farm.

Our increasing population and decreasing arable soil not only in the U. S. but in the world, is bringing other problems. One is meat. We are all familiar with the strides made in cattle breeding, but emphasis is swinging from the biological to the chemical. Chemical additives to animal food introduced in the past few years are bringing hogs and cattle to the markets weeks, and even months, earlier. One part of the increased nitrogen program is the production of urea for cattle feed. A soldier fights on meat and lots of it.

The decreasing ratio between population and sheep from one sheep per person to the present figure of less than 1/6 per person has brought synthetic fibers to the fore not only for civilian use but also military. Prior to World War II synthetic fibers, other than rayon and acetate, were mostly in the pilot plant stage. During the war production expanded relatively fast, mostly for military use, and by 1945 was about 50 million pounds, a fraction of the 800 pound capacity of all synthetic fibers. Capacity increased slowly until Korea but has spurted since 1949—particularly the non-cellulose. It is now estimated that non-rayon fiber capacity will expand almost 500% in the next ten years and represent about 25% of our total synthetic fiber production. (Chart No. 7)

The military uniform and shirt today contain from 15 to 20% of synthetic fiber, not because they are better than wool but because there is just not enough wool to go around. In addition, synthetic fibers offer an opportunity to develop more efficient clothing, especially for the Arctic Region. The future supply of wool will not be sufficient for normal civilian demand even if a military demand does not exist. Synthetic fibers and their basic raw materials have every prospect of being the fastest growing branch of the chemical industry.

The rapid advance in war technology since World War II has produced new high standards for plastic items. World War II was primarily a motorized war. Today we must equip soldiers to be airborne, both for movement of troops and of supplies. In addition we must equip for a truly global war to be fought not only in tropic and temperate zones but also in the Arctic. Weight of equipment is a paramount factor. Ability to stand shock of air drops and to maintain physical property in quick changes from desert temperature of 150 degrees fahrenheit to minus 70 degrees fahrenheit in a few minutes is essential. Materials to meet these new conditions in many cases must be created—a chemical problem to be solved.

One of the most important, rapidly expanding new military raw materials is fiber glass, or asbestos reinforced plastics. Body armor that will stop a .45 caliber slug at ten yards is

Chart 6

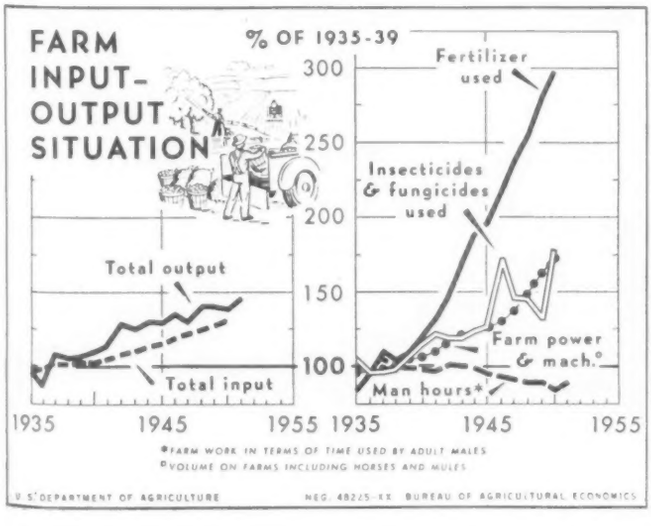
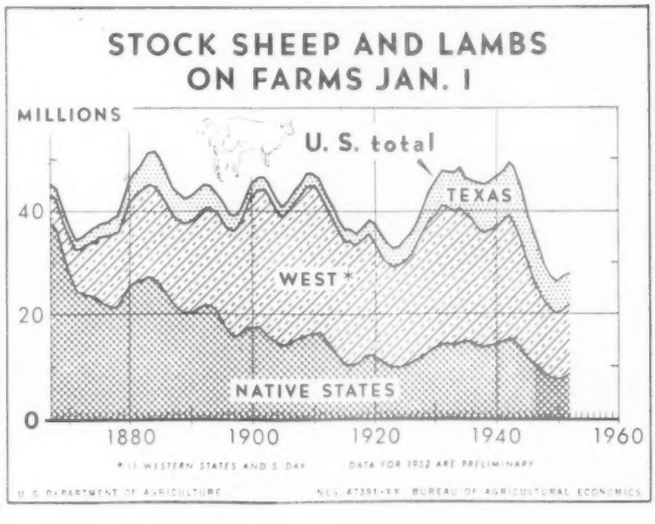


Chart 7



being field tested in Korea, boats using a ton each of plastics are in production and reinforced plastic sleds for use in the Arctic have been standardized.

Although plastic production doubled during World War II to meet military and essential civilian demands, the biggest development was in new and improved plastics and in technique. The impetus to this industry given by the war continued unabated after 1945 and the production doubled again in the next four years to a total production of 1½ billion pounds.

In the first year of Korea production increased abut 50% although much of this was due to abnormal civilian requirements. Production increased 11% to a total of 2 billion 431 million pounds of plastic and resin in 1951. The expansion goal for 1955 is 4.6 billion pounds of plastic materials.

While the military use of plastics in the past two years does not represent, percentage-wise, the use in World War II due to the enormous difference in productive capacity, it has been very substantial. Plastic coverings for field wire, radar and electronic equipment are standard requirements, but the full impact of war has not been felt by the plastic industry excepting in certain types, such as styrene, polyethylene, silicones, fluro resins and phenolics, where an acute shortage in raw materials developed. Potentially the military demand on this industry remains large.

I have touched a few phases of the vital role of the chemical industry in national defense. The industry is well aware of this role and is undergoing the tremendous expansion necessary to fulfill its part. In the past the military expansion has been made under the urgency of a shooting war with the object of winning the war as soon as possible, and return to a peace time economy. The job today is bigger, the end not so visible and the white-hot surge of the American people at war is lacking. We are arming today, not necessarily to fight a war but to prevent the most devastating war in all history.

In the past one hundred seventy-five years our major shooting wars have lasted four to six years. There is every indication that the war being fought by mobilizing our people and our industry to prevent war will last at least that long, and probably longer. The chemical expansion now underway will not be completed before the end of 1955 and this expansion is based on the additional capacity necessary to equip our share of the combined nations military force. To continue to maintain such a force and to produce new improved weapons as they are developed and old ones become obsolete, will probably require another round of accelerated expansion after 1955. If we fail in our plans to prevent a shooting war, a war economy will result such as we can only dimly visualize now.

One thing is certain, an all out war will so deplete our world supply of raw materials such as copper, zinc, tin and other non-ferrous metals that they must be replaced by man made substitutes. The past achievements of the U. S. chemical industry with its reservoir of technical skill and inventiveness, its research laboratories and its able management, are the strongest arm of our national defense today, and for the future, bring what it may.

WINNERS OF AFCA AWARDS TO OUTSTANDING ROTC STUDENTS

JAMES ANDREW YERINA
AFROTC
Ohio State University
Columbus, Ohio

URBAN E. KUNTZ
AFROTC
College of St. Thomas
St. Paul, Minnesota

ANDREW J. CHADWELL
AFROTC
University of Tennessee
Knoxville, Tenn.

RICHARD S. LINDSTROM
AFROTC
Mass. Inst. Tech.
Cambridge, Mass.

ROBERT LOWERY DALTON
NROTC
Rice Institute
Houston, Texas

RICHARD JAMES MERRILL
NROTC
University of Michigan
Ann Arbor, Mich.

GORDON R. WICKER
NROTC
University of Wisconsin
Madison, Wis.

JOSEPH R. FRION
NROTC
University of Oklahoma
Norman, Okla.

JOHN GRIFFIN THWEATT
NROTC
Georgia Inst. of Tech.
Atlanta, Ga.

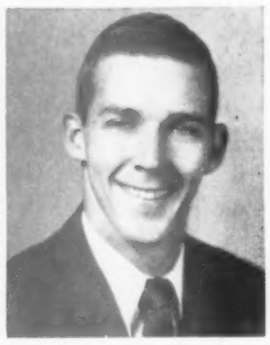
ROBERT MANFRED MESSNER
NROTC
Cornell University
Ithaca, N. Y.

PAUL ROBERT BENSON
NROTC
University of Colorado
Boulder, Colo.

WILLIAM A. SHRODE
ROTC
Purdue University
Lafayette, Ind.

STANLEY LENARD
ROTC
Mass. Inst. of Tech.
Cambridge, Mass.

JARRELL BERT MUGG
ROTC
Texas A. & M.
College Station, Tex.



CECIL JESSE SILAS
ROTC
Georgia Inst. of Tech.
Atlanta, Ga.

ESTUS BRUCE LASSITER
ROTC
Wake Forrest College
Wake Forrest, N. C.

SHERWOOD JOY
ROTC
University of Delaware
Newark, Delaware

CHARLES G. MARTIS
ROTC
Ohio State University
Columbus, Ohio

HARLAN J. BRADY
ROTC
St. Peters College
Jersey City, New Jersey

Bringing Them Back

Life-saving manuals such as these pictured above, are now in the process of revision to incorporate the Holger Nielsen back-pressure arm-lift method of artificial respiration, originally developed as a treatment for nerve gas victims, but now adopted as the standard resuscitation technique in the United States.
—U.S. Army Photo

MAJ. GEN. E. F. BULLENE

Chief Chemical Officer, Department of Army

When Randy's mother left the bedroom, where she had been removing spots from a dress, her son reacted as would any normal 17-month old youngster. He made a grab for the bottle of cleaning fluid on the table. The bottle upset, squirting fluid all over Randy, then rolled off the table and onto the floor.

Randy started to let out a yell, but found that, for the first time in his young life, he couldn't. He didn't have any breath and couldn't seem to get any. He sat down on the floor to think this over, but decided he was too tired anyhow, so he put his head down in the puddle of cleaning fluid and went to sleep. Or perhaps it was the other way around; he went to sleep and then put his head in the puddle.

When Randy's mother returned a few minutes later—wondering at the unseemly quietude in the bedroom—Randy was in pretty bad shape. The average person would have said he was "out cold." A doctor would have termed his condition "apneic." For Chemical Corps purposes, Randy was a first rate toxic gas casualty and, had it not been for his father, he would probably have become an item for the vital statistics department.

Fortunately, Randy's father, an Army officer,[1] had only recently completed a course in chemical, biological and radiological training. As an adjunct of this he had received instruction in an improved method of artificial respiration known as the "back-pressure arm-lift" or Holger Nielsen method. Bounding up the stairs in answer to his wife's scream, he rushed Randy into an adjoining room, ordered his wife to open the window and call a doctor, then proceeded to put his new-found knowledge to work.

He laid Randy prone on the floor with his head lying sideways on his crossed hands. Then, kneeling at the boy's head, he placed his hands on Randy's back in such a way that the heels of his hands were just below the lower tip of the shoulder blades and, with his arms straight, eased his weight forward. Randy promptly exhaled a copious quantity of cleaning fluid fumes. Then, rocking backward, he grasped the boy's arms just above the elbows and pulled them upward until the elbows were about on a line with the top of Randy's head. Randy inhaled lustily.

For story purposes, it would be nice if we could say here that after a few such treatments, Randy got up and walked away. That didn't happen. The father worked for some time and, getting no apparent results, he decided to make a dash for the hospital. But when he got to the front sidewalk, he saw that Randy had turned an unhealthy shade of blue. Knowing that he could never make it to the hospital, he put Randy on the sidewalk and began the "push-pull" treatments again. He doesn't remember now just how long he worked on the lad, but it was "some time" later that Randy began to breathe under his own power and shortly thereafter, began a subdued squalling.

This incident occurred last December and (at this writing) was the first case on record[2] of a person's life having been saved with the Nielsen artificial respiration method since it was formally adopted as the standard for field and combat resuscitation by the U. S. Armed Forces Medical Policy Council on November 5, 1951.

The story of the acceptance of the Nielsen technique of

[1]American Red Cross identifies him as W/O Jack V. Davidson, GHQ, Military District of Alabama, Birmingham, Ala. Incident occurred December 22, 1951.

[2]The Red Cross keeps a check of life saving cases for award purposes, and usually receives a number of reports on each such accident. This is the first report received on use of the Nielsen method since it was adopted, but it is by no means the first time it has saved a life. There are also several cases of the use of the hip-lift recently.

resuscitation—and incidentally, the abandonment of the old stand-by Schafer-prone method—is of particular interest to the Army Chemical Corps, because it is the direct result of a research project that has been under way at the Chemical Center at Edgewood, Md., ever since our technicians there got their first inadvertent whiff of the German nerve gases back in 1945.

The idea of the revival of the apparently dead has been a source of fascination throughout history, understandably so because of the too-thin line of demarkation between the apparently dead (not breathing and no pulse) and the actually dead (same thing). This fascination has been compounded into an aura of mysticism by the human body's ability to absorb a terrific amount of punishment and still revive and survive.

Among the ancients, artificial resuscitation was guided by the superstition that a person not breathing and having no pulse was either already dead or in a profound sleep from which he might or might not be awakened. The awakening process took such bizarre forms as tickling the victim's nose with a feather, firing a cannon, jabbing him with a hot poker, rubbing his feet with salt, roasting him over a smoky fire, plucking out his hair and wringing him out like a wet rag. The efficacy of such methods could be vouched for by the fact that the victim sometimes—although not very often—actually did revive of his own accord and in spite of the treatment.

Later, medical science determined that a person totally incapacitated as a result of drowning, poisonous fumes, shock or paralysis was suffering not so much from a lack of sleep as from a lack of oxygen. This concept brought about a whole new series of treatments to empty the lungs of whatever they were full of and to replace it with clean air. These included rolling the victim in a barrel, rolling him over a barrel (a method still used in some localties), flailing his arms about, tossing him in a blanket, pushing him in the chest, abdomen or kidneys, riding him potatosack-like on a cantering horse, and finally—and usually fatally—sticking a bellows up a nostril and pumping him up like a balloon.

Most of these methods hinged around the generally correct assumption that any violent muscular action would agitate the victim's diaphragm and effect an exchange of air in his lungs. Crude as these methods were—and again discounting those who would have revived of their own accord anyhow—they scored a higher percentage of "saves" than can be credited to the earlier "awake-arise" school of resuscitation. There were, however, a number of manifest shortcomings. The hapless victim, even after revival, had but a poor chance of surviving the almost inevitable shock, pneumonia, limb fractures, lung punctures or spleen ruptures garnered in the initial treatment. And the gallant rescuer, once having revived the victim, was often in such a state of physical exhaustion as to require resuscitation himself.

In fairness to the medical profession, it must be said that by the late 1800's, there were several approved methods of resuscitation in use, both manual and mechanical. These were used primarily in the treatment of paralytics and in the revival of patients where anesthesia had mis-fired. Both the equipment and the operational techniques were frequently quiet elaborate and their use was generally confined to the operating room. No scientifically sound respiration method was ever made available to the one who needed it most: i.e., the man on the street, or more accurately, the man nearest the one in the water.

To fill this need, the British Royal Medical and Chirurgical (Surgical) Society at the turn of the century, named a committee of scientists headed by Professor E. A. Schafer[1] to develop a resuscitation method that would be practical for general use. The committee attacked the problem scientifically and sought first to determine exactly what happens when a person drowns, a question that even now isn't altogether clear. After the inspection of countless human drowning and gas victims, and later, the drowning of anesthesized dogs, the committee made its formal report in 1903.

From this report was evolved the famed Schafer-prone method of artificial respiration, a method easy to teach, easy to carry out, and, above all, effective. Thousands of lives have been saved by it.

The Schafer method is too well known and universally used to need description here. Essentially, it entails a simple "push" technique by which the contaminated or oxygen-depleted air is forced from the lungs by compression of the chest and abdomen and fresh air is inhaled by the elastic recoil of the chest.

Despite its popularity, many have believed that the Schafer method was by no means ideal and that there were other techniques that would produce a much greater exchange of air in the lungs. Several attempts were made to introduce the improved methods, but they got nowhere. The very universality of the use of the Schafer system forestalled any effective attempt to reeducate the millions of people who knew it into undertaking a substitute method. Also, the proposed improved methods—at least those prior to 1935—generally had one or more shortcomings. They were either too hard to teach, needed some mechanical device or "gadget," were too exhausting on the operator, too rough on the victim, or impractical if the victim was injured.

The Armed Forces had also made several stabs at revising resuscitation procedures but had gotten nowhere for much the same reasons as those given above. The Army had been teaching artificial respiration (the Schafer method) as an adjunct to basic first aid training. The Army Technical Manual *Treatment of Casualties from Chemical Agents* (TM 8-285), issued as late as 1945, mentioned artificial respiration as a possible corollary treatment for certain gas poisonings, but it didn't even say how it was to be performed. The Navy, because of the ever-present danger of drownings, taught arti-

Dr. David B. Dill, Scientific Director of the Army Chemical Center Medical Laboratories, who served as coordinator on the artificial respiration project. —Army Chemical Center Photo

[1]See "Drowning and Life Saving," **Encyclopaedia Britannica**, XIV edit.

FIGURE 1—Initial position: Victim is placed faced-down (prone) and face placed upon his hands. Operator places his hands, fingers spread, at mid-back just below shoulder blades.

FIGURE 2—Pressure phase: Operator rocks forward allowing his weight to exert slow, steady even pressure downward on hands. Note that operator's arms art straight and nearly vertical. Release pressure quickly by "peeling" hands from victim's back without giving extra push with the release. This expels the foreign matter from the victim's lungs.

ficial respiration to all personnel as a part of routine basic training.

Preliminary experiments with the captured German nerve gases made two things clear: 1) that the treatment of nerve gas casualties would necessitate immediate and effective artificial respiration, probably for an extended length of time and in addition to the administration of counteractive drugs; and 2) that the Schafer-prone method of respiration would be totally useless in the majority of cases.

One of the deadliest of the properties of nerve gases is its ability to paralyze the respiratory muscles. This will occur after a very few sniffs of a high concentration of the gas and, since the effects of the gas are cumulative, will eventually come about in even very light concentrations. To be effective against the gas, any resuscitation method must be able to remove stale air from the lungs and replace it with clean air. This would be impossible under the Schafer method, because with the lungs collapsed and the thoracic muscles relaxed, there would be no elasticity to pull clean air into the lungs. This difficulty is further compounded by these facts:

1) Even with the administration of counteractive drugs, artificial respiration must begin within nine minutes at a maximum if the vctim is to live and, even then, his central nervous system may have been irreversibly damaged by the lack of oxygen.

2) The rescuer will often be working on a highly contaminated victim and will himself be contaminated by the victim's clothing unless he is masked and wearing rubber gloves, at least.

3) The victim, too, will have to be masked, so that any artificial respiration, to be effective, must be able to pull air through a canister.

When these facts and their possible implications became fully realized by the other armed services and the civil defense agencies, interest in the development of an improved resuscitation technique became nationwide. A number of interested agencies, both military and non-military, discussed the problem at a National Research Council conference in Washington late in 1948 and at a symposium at the Army Chemical Center in 1949. The project was given a top priority in January of 1950 when the Secretary of Defense ordered a revision of the 1948 Army technical manual on gas casualty treatments to incorporate the treatment of nerve gas cases and to make the manual applicable to all of the armed forces.

This resulted in the appointment of a joint Army, Navy and Air Force task force to rush the project through. Members of the task force were: Col. John R. Wood, then Chief of the Medical Division at the Army Chemical Center (now Chairman of the Medical Research and Development Board of the Office of the Surgeon General); Commander Paul F. Dickens of the Navy Bureau of Medicine; and Major John Rizzolo of the Air Force Surgeon General's office.

Because of the extensive research already conducted on nerve gases by the Chemical Corps, the task force had a relatively easy time redrafting the technical manual in so far as decontamination and other protective aspects of the gas were concerned, but it ran into a snag on the artificial respiration phase of the problem. Experimental work had proved the inefficacy of the old Schafer method but it had not yet produced a proven substitute.

To meet this problem on short notice, the task force contracted with the medical departments of several colleges to carry out the needed research. The men who conducted the experiments included Dr. Archer S. Gordon of the University of Illinois; Dr. Julius H. Comroe, Jr., of the University of Pennsylvania Graduate School of Medicine; Dr. Peter V. Karpovich of Springfield College, and Dr. James L. Whittenberger of Harvard University. Because of his wide experience in the research already conducted, Dr. David B. Dill, Scientific Director of the Chemical Corps Medical Laboratories at Edgewood, was named coordinator of the project. Costs of the project were borne largely by the three services through the Office of Naval Research. The investigations were benfited by a wealth of experimental work done previously by non-military agencies having a keen interest in life saving generally. These included the American Red Cross, the Federal Civil Defense Administration, the Federal Bureau of Mines, the U. S. Public Health Service, and a member of industrial commercial firms, notably the American Telephone and Telegraph Company.

One of the first points agreed upon by members of the research committee was that no resuscitation method would be acceptable that involved the use of any gadget or equipment. This ruled out, for instance, the Eve rocking method[1] in which the victim is rocked up and down on a see-saw. It is frequently used in emergency treatment of polio victims in hospitals but, obviously, a soldier in combat cannot be expected to carry a see-saw around with him.

This limitation left five methods of resuscitation that were either already in isolated use or which had been suggested as possible substitutes for the Schafer method. These included:

[1]Suggested in 1936 by Dr. Frank C. Eve, of the British Royal Infirmary and consultant to the British Navy, as a means of reviving drowned sailors.

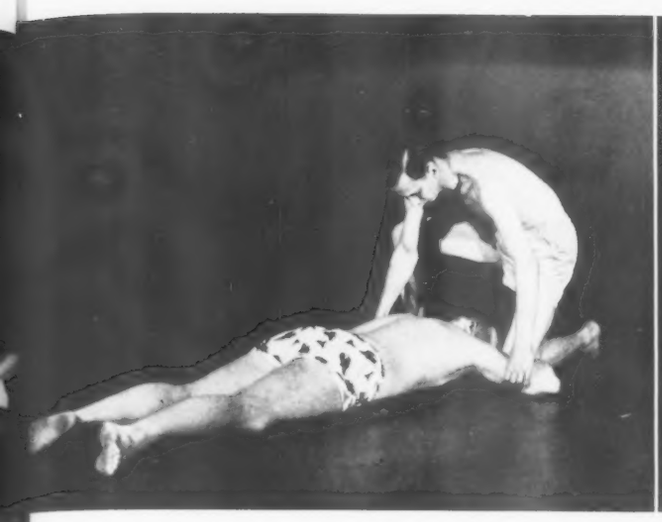


FIGURE 3—Positioning the hands on the victim's arms near his elbows. As operator rocks backward he must retain firm grip on victim's arms.

FIGURE 4—Lift phase: Operator leans back with his arms nearly straight causing victim's arms to raise enough to arch his back and partially raise his chest from the ground. This expands victim's lungs which draw in fresh air.

1. The arm-lift chest-pressure (Silvester) method, widely used in Europe and in industry here, in which the victim is placed on his back and his arms alternately raised above his head and then pressed against his chest to effect expiration.

2. The back-pressure arm-lift (Nielsen) method, described earlier in Randy's case. This technique was described in a scientific paper published in Denmark in 1932, reprinted in the U. S. in 1936. This method, however, seems to be much older, possibly antedating the Schafer method. An official at the Danish Embassy in Washington says he was taught it in high school in Denmark in 1909.

3. The hip-lift back-pressure method in which the victim's hips are lifted several inches from the ground. The sagging of the abdominal organs causes the diaphragm to drop, effecting inspiration. This method was suggested by J. H. Emerson, an inventor and manufacturer, in 1948.

4. The hip-roll back-pressure method, a variation of the hip-lift in which only one hip is lifted. It can be performed either with or without the prone pressure.

The Chemical Corps had already compiled a wealth of data on each of these methods from earlier experiments on anesthesized animals and human cadavers. These data were not necessarily conclusive, however, since neither the animals nor the corpses would react exactly as would an apneic human.

What was lacking was a definite knowledge of the exact amount of air that would be exchanged by each of the methods. Additional information was needed on the relative case of performing each method, its teachability, its discomfort to the victim and its possible application or non-application to injured persons.

To gain this information Doctors Comroe and Whittenberger undertook a series of tests on anesthesized, unconscious, paralyzed or newly-dead persons. These were mostly emergency patients brought into hospitals in the Boston and Philadelphia areas. Some were shock, stroke, traffic, drowning or gas victims, but a great many were alcoholics so dead drunk that they were literally knocking on the door to the hereafter. The scientists maintained a 24-hour vigil in order to catch newly deceased persons before rigor mortis had set in.

Simultaneously, Dr. Karpovich conducted a second series of studies on a large group of students to determine the pulmonary ventilation achieved by each of the resuscitation methods. The tests were not conclusive for any one method, since the subjects were normal, healthy and conscious humans, but they did serve to show the relative air exchange effected by the techniques. He coupled these tests with measurements of the actual energy used by the operators in performing at the Great Lakes Naval Training Station. More than 1,400 Navy recruits and WAVES participated in the experiments, some as "victims" and others as operators. Almost from the outset, it was clear that the final choice would be between the Nielson and one of the hip methods.

Before making the decision, a further series of tests, far more spectacular and dangerous than the others, were carried out at the University of Illinois by Dr. Gordon and his associate, Dr. Max Sadove, an anesthesiologist. These involved the actual resuscitation of persons in the same condition that would occur in an attack with nerve gases. Fifty healthy male volunteers were paid to serve as guinea pigs for the tests. They were wired to the latest of scientific instruments to maintain a constant check on the respiratory ventilation, oxygen content of the blood and heart action. The volunteers were "knocked out" with pentothal, then rendered totally apneic with curare, a drug that paralyzes the muscles. The two drugs together produced a condition nearly identical to that produced by nerve gas. The "victims" were kept in this condition for periods averaging an hour while the tests were run.

Because of the skill of the investigators and their extreme care in conducting the experiments, no complications developed to cause any ill effects in any of the volunteers. In two cases, a severe bronchospasm developed. The Schafer technique proved to be totally useless in both of these cases, but breathing was adequately maintained with the "push-pull" methods.

Although there were minor variations in the results of all the experiments, significantly, all of the results pointed to identical conclusions. At a meeting of the research teams in Philadelphia in June of 1951, agreement was reached on the following salient points:

1. The Schafer-prone method should be abandoned.

2. The arm-lift chest-pressure method (Silvester) gives adequate ventilation of the lungs, but is unsatisfactory because the tongue is likely to fall back and jam in the throat.

3. The hip-roll back-pressure gives excellent ventilation, but it is exhausting on the operator and is very hard to teach.

4. The hip-lift back-pressure gives the greatest exchange of air of any of the methods tested, but is exhausting on even a powerful man and cannot be conducted by a child or a small woman.

5. The back-pressure arm-lift (Nielsen) method gives more than adequate ventilation, can be carried out by a child or a small woman, and is easy to teach.

It was therefore recommended by the task force that the Nielsen method be adopted as the method of the first choice for military use. It was also recommended that the hip-lift back-pressure method be taught as the method of the second

choice, to be used if manpower is available to carry it out for an extended period, or if arm injuries make it impossible to perform the Nielsen method.

The value of the hip-lift back-pressure method, when the manpower is available to use it, was dramatically shown a few weeks later. One afternoon last August Washington, D.C. was lashed by a sudden thunder and lightning storm accompanied by nearly an inch of rain in an hour. Lightning struck homes, power poles and trees throughout the city. When a bolt struck a tree on New York Ave., it left a human victim lying in the gutter, apparently dead.

The men of the D.C. Fire Department's Rescue Squad No. 2, who noted that the victim was "without pulse or heartbeat," used a mechanical resuscitator on him at first, but when it appeared he was too far gone tried the "hip-lift" method. He was revived within 20 minutes. A few hours later, despite the severe burns on his abdomen, he was telling his hospital nurse that he felt "just fine." The firemen had seen the hip-lift back-pressure method described in an issue of the *Journal of the American Medical Association* and a newspaper story and had been practicing it among themselves for a couple of weeks. Their use of it on the lightning victim was more or less just an experiment—"We thought we'd like to try it, because he looked pretty far gone"—but it turned out to be dramatic proof of the efficiency of this method.

The June recommendations of the committee were immediately accepted and instructions for performing the Nielsen method were included in the new section on nerve gases in the revised Army, Navy and Air Force technical manual "Treatment of Chemical Warfare Casualties" when it was issued last August. The manual also includes instruction in both the hip-lift and the hip-roll techniques. Pending the revision of the appropriate Field Manuals and Technical Manuals, the Army has published a *Training Circular* (TC No. 15-25 March '52) in order to implement the new artificial respiration methods.

A short time later, at the request of the Red Cross and other non-governmental agencies, the National Research Council called a conference to consider feasibility of making the Nielsen method the standard resuscitation technique of the nation as a whole. After hearing the reports of the top military and medical authorities who had worked on the research project, the Nielsen method was formally adopted. The non-military agencies made one slight change. They stipulated that the Nielsen method should be referred to as the "back-pressure arm-lift" method rather than the other way around. It was hoped that this wording would help to stress the importance of applying the back-pressure step first as a means of clearing the air tract.

The Nielsen technique is now a standard part of the chemical defense training that has been given on a service-wide basis in recent months. The various non-military agencies in and out of the government are now cooperating in a nation-wide campaign to educate the American public in the use of the improved resuscitation system. It is expected that the program will be well under way by the end of the swimming season this coming summer.

Today little Randy is alive and healthy. Tomorrow there will be other "little Randys" living a normal life after being at death's door. And there will be grownup "Randys"—victims of water accidents, industrial mishaps and other crises—who will return to life because someone applied the Nielsen "back-pressure arm-lift" method of artificial respiration on their apparently lifeless bodies.

And, in history's ledger another notation will be made on the credit side for military science. For, in seeking a means of reviving nerve gas victims we have been able to present to the American public the heretofore little-known Nielsen method of bringing drowning victims back to life.

Lt. Col. Holger Nielsen, developer of the "back-pressure arm-lift" method of artificial respiration, is living today in a cottage on the outskirts of Copenhagen, Denmark, where he was born in 1866. The son of a Danish Guardsman, Nielsen entered the Danish Army Cadet School at 14 and was commissioned in the Danish Coast Artillery in 1891. In World War I, he commanded a battery at Hvidore, and in 1916 was given the additional duty of Chief of the Copenhagen Air Defense, a post in which he commanded 460 civilian machine gunners. This defense corps was reactivated in World War II and is still active.

The Developer

A life-long sports enthusiast, Nielsen participated in the Olympic games in Athens in 1896 and was captain of the champion Danish gymnastics team in the 1906 Olympics. He subsequently held a number of high public health offices in Copenhagen and with the national government of Denmark. He is credited with having invented the game of "handball," which is now popular in America. In conjunction with his swimming instruction and life-saving work, Nielsen had taught the Silvester method of resuscitation, and adopted the Schafer system when it was introduced in 1903. However, he was satisfied with neither and proposed his own arm-lift method in 1905 and it was formally adopted in Denmark and, subsequently in the other Scandinavian countries. The method, however, received small notice in the United States until the Chemical Corps began its resuscitation experiments after World War II.

Lt. Col. Nielsen retired from public service eight years ago at the age of 78. He holds the Red Cross Medal of Merit from Norway and Sweden, as well as Denmark, in addition to the Norwegian Gold Medal for Life Saving, and is a member of The Order of Dannebrog, the Swedish Vasa Order, and is an Officer of the Greek Order of the Savior.

Lt. Col. Nielsen's son, Ove Nielsen, now Chief of the Shipping Department for the Danish Ministry of Commerce, Industry and Shipping, was outstanding during the last war for his work with the Danish underground during the German occupation of Denmark.

MUSCLE SHOALS CHLORINE PLANT STARTS OPERATION

A final inspection of the plant is made by the project heads as the plant goes into operation. Left to right—Major Robert Trathen, site project officer for the Chemical Corps; Colonel Victor C. Searle, commanding officer of the Chemical Corps' Chicago Procurement District; Lt. Colonel Paul M. Long, Corps of Engineers, commander of the Muscle Shoals area office of the Engineers; Colonel Walter K. Wilson, Mobile District engineer, Corps of Engineers; William I. Johnson, Leonard Construction Company, general superintendent; and J. H. Zwemer, Monsanto representative and project manager.

Completed at a cost some seven per cent lower than the original estimate and in slightly more than a year's time, the Chemical Corps' new chlorine plant at Muscle Shoals, Ala., has been placed in operation. Announcement of the completion was made jointly, late in May, by the Department of Defense and the Monsanto Chemical Company of St. Louis, which will operate the plant under contract.

Using tremendous amounts of salt, treated at Arctic temperatures, the plant will produce liquid chlorine, caustic soda and hydrogen in one of Muscle Shoal's newest industries.

One of the largest chlorine plants of its type in the world, it is located adjacent to the TVA chemical plant near Wilson Dam. The plant officially went into operation May 9 and is the first large installation in the United States to use the deNora mercury cells, a process developed in Italy. It will produce chlorine required by the Army Chemical Corps for the production of defense materiel.

The plant was designed and constructed by Leonard-Monsanto, a joint venture consisting of Leonard Construction Company of Chicago and the Monsanto Chemical Company of St. Louis. J. H. Zwemer, Monsanto representative, was project manager and W. I. Johnson of Leonard Construction Company was general superintendent. Monsanto is operating the chlorine plant for the United States Government.

The multi-million dollar chlorine-caustic plant, started in the spring of 1951, was completed in approximately one year. Construction was under the direct supervision of the Corps of Engineers, Mobile District office, Colonel Walter K. Wilson, Jr., district engineer. Lt. Col. Paul M. Long, Corps of Engineers, commander of the Muscle Shoals area office of the Corps of Engineers, supervised field construction. Major Robert Trathen has acted as Site Project Officer under the Office of the Special Assistant to the Chief Chemical Officer, Department of Army.

One-half of the semi-automatic plant, which will eventually employ about 150 people, went into operation during the first part of May, according to Colonel Long, area engineer in charge of the project. The second half was completed a few weeks later.

The heart of the multi-million dollar plant is a huge room, two and one-quarter acres in area, in which banks of deNora cells silently convert salt into chlorine and two by-products, hydrogen and caustic soda.

The chlorine is collected from each cell, cooled, dried and liquefied by compressing at a temperature of about 40 degrees below zero Fahrenheit.

Part of the caustic soda is also used by the Department of the Army. All of the hydrogen, a highly inflammable gas, is fed into the plant steam boilers as fuel, reducing the consumption of natural gas.

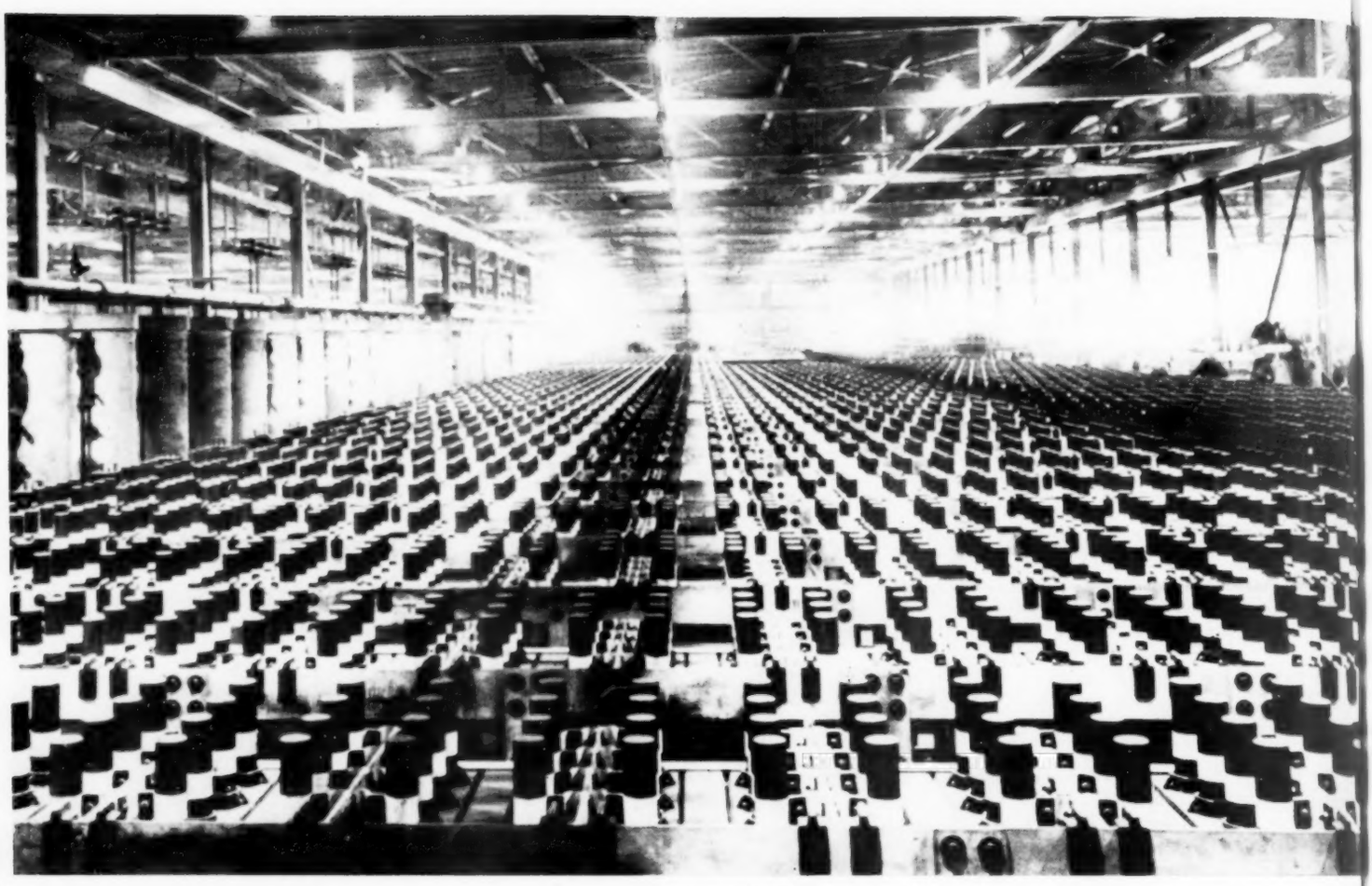
The cooling process uses approximately 10,000 gallons of water per minute. The water is obtained from the Tennessee River and flows through a 24-inch main to the chlorine-caustic plant. A one-half million-gallon water tank has been installed for fire protection and plant water reserve.

Approximately one-half million board feet of Southern pine lumber was used in the construction of walkways within the two and one-quarter acre main building. Also used in the structure were approximately 779 tons of copper, 80 tons of nickel, 5,600 tons of steel and about 500 tons of copper wire (approximately 1,000,000 feet).

The largest transformers ever transported by Southern Railway have been installed at the plant and approximately 1,000 tons of switchgear, transformers, circuit breakers and other electrical transmitting equipment have been set in the yards. The process will use about $3,000,000 in mercury supplies.

Approximately $2,000,000 has been spent locally for supplies and materials since the ground for the plant was broken on March 6, 1951. Well over $5,000,000 was distributed in payrolls during the construction period. All personnel for the operation of the plant were hired locally, excepting a few key employees.

Barges of salt from Louisiana mines arrive at Muscle Shoals on the Tennessee River after making their way to Paducah, Ky., on the Mississippi. Upon arrival, the salt is dissolved in water to make a saturated solution, or brine. Impurities, such as calcium, magnesium and iron, are removed from the brine by adding chemicals which cause them to settle as a sludge.



Banks of deNora cells

The sludge is pumped out and the brine filtered. Purified brine is pumped into cells, long narrow steel troughs lined with a chemically resistant stone. Suspended in the troughs are blocks of dense graphite which serve as positive poles, or anodes. They are supported by hard rubber covers which seal the top of the trough and make it gas tight.

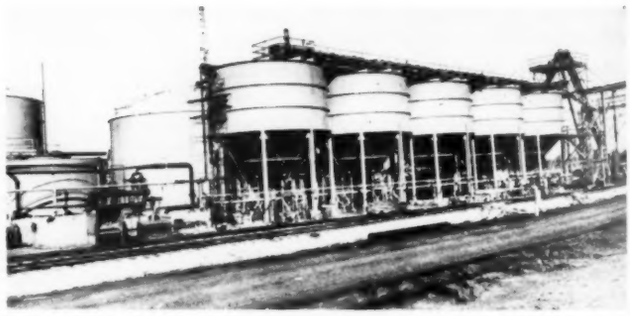
A thin film of mercury flowing along the bottom of the trough, serves as the negative pole, or cathode. Only a fraction of an inch separates the graphite anodes and the mercury cathode.

It is in this tiny space that the electrical breakdown, or electrolysis, of the brine takes place. As the brine enters the cell, it flows on top of the mercury and is decomposed by the powerful electric current passing between the mercury and the graphite electrodes. The chlorine is released as a gas in the space above the brine and beneath the hard rubber covers.

The sodium dissolves in the mercury and forms mercury amalgam. The chlorine is withdrawn and liquefied. The mercury-sodium combination flows into a small steel tower packed with lumps of graphite. Water is also fed to the tower. In contact with the graphite, the water reacts with the sodium in the amalgam and forms caustic soda and hydrogen.

The hydrogen is piped away from the top of the tower, the caustic soda flows into storage tanks and the mercury returns to the cells for re-use. The brine leaving the cell, which still contains some undecomposed salt and minute amounts of chlorine, is de-chlorinated and returned to the salt dissolving system where it is again made into saturated brine.

Monsanto Chemical Company owns the patent rights to the deNora process in North America and has been in the chlorine-making business since 1917. Monsanto manufactures chlorine for use as a bleaching agent for textiles, straw and sponges, water purification, extraction of gold, disinfectant, germicide, insecticides and oxidizing and reducing agents in chemical syntheses.



Brine storage facilities

Mr. Zwemer, project manager for Leonard-Monsanto during construction, has resigned from Monsanto effective 1 June. Carl Pfeiffer assumed the position of plant manager replacing Zwemer. Other officials at the plant include J. F. Roe, production superintendent; J. F. Schlosser, chief accountant and office manager; E. J. Burckhardt, chlorine supervisor; A. Beddoe, personnel manager; R. C. Roberts, superintendent of maintenance; and H. Twellman, purchasing agent.

The Alabama Department of Public Health has approved the sanitary sewage disposal system of the local plant. Monsanto has also received a permit to discharge liquid waste into the Tennessee River in accordance with public health laws of the state.

RESEARCH AND DEVELOPMENT

(Continued from page 15)

Nor is our approach haphazard. At the present time, there is a Chemical Corps officer whose sole function is to circulate through the chemical industries to obtain information on research and development work of possible interest to us. In order to protect the commercial interests involved, his reports are kept strictly confidential.

This is one way we keep up with the American Chemical Industry, but you people here today are one of our important assets.

For example, a short time ago, your President, Dr. Walter Lawson, got in touch with me. He said they were fooling around with a new chemical in their laboratories that we might like to know about. It is a chemical which seems to have possibilities in three different directions—as a primer for lacquer on certain plastic surfaces, as an ingredient for a fire-proof paint, or as one of the principal ingredients for a screening smoke. We are now evaluating this compound more fully in our own laboratories.

This is just one instance of many in which the Armed Forces Chemical Association has provided a valuable link between the Chemical Corps and civilian industry. Your presence here today symbolizes that cooperation between industry and the Armed Forces is so essential to the success of military research and development. It is only with such cooperation that we can do the job we have been assigned—the job of making this Country secure against the most advanced forms of modern warfare.

NITROGEN DIVISION FORMED BY ALLIED CHEMICAL & DYE

Allied Chemical & Dye Corporation has formed a new division to be known as Nitrogen Division, to take over on June 1, 1952, the manufacturing and related operations of the Nitrogen and Organic Sections of The Solvay Process Division, the nitrogen sales of the Sales Agency Department of The Barrett Division, and the Nytron, methanol and formaldehyde sales of Solvay Sales Division. The sales and other personnel now engaged in the activities to be taken over will be transferred to Nitrogen Division and will continue in their present capacities.

Mr. Hugo Riemer, formerly Vice President of the Solvay Process Division, has been elected President of the new Nitrogen Division. Mr. Riemer is a Vice President of the Armed Forces Chemical Association.

The executive and sales offices of the Nitrogen Division will be at 40 Rector Street, New York 6, N. Y., telephone Whitehall 4-0800.

GROUP AND SUSTAINING MEMBERS

OF THE ARMED FORCES CHEMICAL ASSOCIATION

Abbott Laboratories, North Chicago, Ill.
Aerial Products. Inc., Elkton, Md.
Affiliated Gas Equipment, Inc., Cleveland, Ohio.
Air Reduction Company, Inc., New York, N. Y.
Allen Manufacturing Company, Inc., Nashville, Tenn.
Allied Chemical & Dye Corporation, New York, N. Y.
American Aniline Products, Inc., New York, N. Y.
American Cyanamid Company, New York, N. Y.
American Stove Company, St. Louis, Mo.
American Zinc, Lead & Smelting Company, St. Louis, Mo.
Armour & Company, Chicago, Ill.
Armstrong Cork Company, Lancaster, Pa.
Atlas Powder Company, Wilmington, Del.
Baker & Company, Inc., Newark, N. J.
Bastian-Blessing Company, The, Chicago, Ill.
Bastian-Morley Company, Inc., LaPorte, Ind.
Bechtel Corporation, San Francisco, Calif.
Benjamin Reel Products, Inc., Cleveland, Ohio
Bird Machine Company, South Walpole, Mass.
Blaw-Knox Construction Company, Pittsburgh, Pa.
Blickman, S., Inc., Weehawken, N. J.
Bowser, Inc., Chicago, Ill.
Bridgeport Brass Company, Bridgeport, Conn.
Bristol-Myers Company, New York, N. Y.
Brown Company, Berlin, N. H.
Buffalo Electro-Chemical Company, Inc., Buffalo, N. Y.
Canfield, H. O., Company, The, Bridgeport, Conn.
Casco Products Company, Bridgeport, Conn.
Celanese Corporation of America, New York, N. Y.
Central Foundry Company, The, Newark, N. J.
Chamberlain Corporation, Waterloo, Iowa
Chicago Electric Manufacturing Co., Chicago, Ill.
City Chemical Corp., New York, N. Y.
Continental Oil Co., Ponca City, Okla.
Crown Can Company, Philadelphia, Pa.
Curtis Industries, Inc., Helene, Chicago, Ill.
Diamond Alkali Company, Cleveland, Ohio
Dow Chemical Company, Midland, Mich.
Dunham, C. A., Co., Chicago, Ill.
E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
Eaton Manufacturing Company, Cleveland, Ohio
Empire Stove Company, Belleville, Ill.
Ethyl Corporation, New York, N. Y.
Eureka Williams Corp., Bloomington, Ill.
Evans Research & Development Corp., New York, N. Y.
Federal Laboratories, Inc., Pittsburgh, Pa.
Ferguson, H. K., Company, The, Cleveland, Ohio
Ferro Corporation, Cleveland, Ohio
Firestone Industrial Products Div., Fall River, Mass.
Fisher-Price Toys, Inc., East Aurora, N. Y.
Fisher Scientific Co., New York, N.Y.
Foster-Wheeler Corporation, New York, N.Y.
Fram Corporation, Providence, R. I.
Fraser & Johnston, San Francisco, Calif.
Fuller, W. P., & Company, San Francisco, Calif.
Gasket, Packing & Specialty Co., Inc., New York, N. Y.
Gates Rubber Co., The, Denver, Colo.
General Aniline & Film Corporation, New York, N. Y.
General Dyestuff Corporation, New York, N. Y.
General Tire & Rubber Company, The, Wabash, Ind.
Glyco Products Company, Inc., Brooklyn, N. Y.
Goodrich, B. F., Chemical Company, Cleveland, Ohio
Goodyear Tire & Rubber Company, Akron, Ohio
Gratan & Knight Co., Worchester, Mass.
Gray Stamping & Manufacturing Co., Plano, Ill.
Green Colonial Furnace Company, Des Moines, Iowa
Greer Hydraulics, Inc., Brooklyn, N. Y.
Grote Mfg. Co., The, Bellevue, Ky.
Gulf Oil Corporation, Pittsburgh, Pa.
Haertel, Walter, Company, Minneapolis, Minn.
Hamilton Manufacturing Corporation, Columbus, Ind.
Handy & Harman, New York, N. Y.
Harshaw Chemical Company, The, Cleveland, Ohio
Harvey Machine Co., Inc., Torrance, Calif.
Hercules Powder Company, Wilmington, Del.
Heyden Chemical Corporation, New York, N. Y.
Hooker Electrochemical Company, Niagara Falls, N. Y.
Howell Company, The, St. Charles, Ill.
Hyman, Julius & Company, Inc., Denver, Colo.
Industrial Rubber Goods Company, St. Joseph, Mich.
International Nickel Co., Inc., New York, N. Y.
International Silver Company, Meriden, Conn.
Jefferson Chemical Company, Inc., New York, N. Y.
Kellogg, M. W., Company, The, New York, N. Y.
Kold-Hold Manufacturing Company, Lansing, Mich.
Koppers Company, Inc., Pittsburgh, Pa.
Kwikset Locks, Inc., Anaheim, Calif.
LaBelle Industries, Inc., Oconomowoc, Wisc.
Lambert Pharmacal Company, St. Louis, Mo.
Little, Arthur D., Inc., Cambridge, Mass.
Mason, L. E., Company, Hyde Park, Mass.
Mathieson Chemical Corporation, Baltimore, Md.
McInerney Spring & Wire Co., Grand Rapids, Mich.
Merck & Company, Inc., Rahway, N. J.
Metal & Thermit Corporation, New York, N. Y.
Moe Light, Inc., Ft. Atkinson, Wisc.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Monsanto Chemical Company, St. Louis, Mo.
Mundet Cork Corporation, New York, N. Y.
National Can Corporation, New York, N. Y.
National Fireworks Ordnance Corp., West Hanover, Mass.
Nesco, Inc., Milwaukee, Wisc.
Niagara Alkali Company, New York, N. Y.
Niagara Blower Co., New York, N. Y.
Nopco Chemical Co., Inc., Harrison, N. J.
Olin Industries, Inc., East Alton, Ill.
Oronite Chemical Company, San Francisco, Calif.
Parsons, Ralph M., Company, The, Los Angeles, Calif.
Pemco Corporation, Baltimore, Md.
Penick, S. B., & Company, New York, N. Y.
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.
Pfister Chemical Works, Inc., Ridgefield, N. J.
Pfizer, Chas., & Company, Inc., Brooklyn, N. Y.
Philco Corporation, Philadelphia, Pa.
Phillips Petroleum Company, Bartlesville, Okla.
Pittsburgh Coke & Chemical Co., Pittsburgh, Pa.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Rau Fastener Co., The., New York, N. Y.
Rheem Manufacturing Company, New York, N. Y.
Rohm & Haas Company, Philadelphia, Pa.

Rowe Manufacturing Company, Whippany, N. J.
Rudy Manufacturing Co., Dowagiac, Mich.
Shell Development Company, Emeryville, Calif.
Sheller Mfg. Co., Dryden Rubber Div., Chicago, Ill.
Sherwin-Williams Company, The, Cleveland, Ohio.
Shwayder Bros., Inc., Denver, Colo.
Snell, Foster D., Inc., New York, N. Y.
Sprague Electric Company, North Adams, Mass.
Standard Oil Company (Indiana), Chicago, Ill.
Standard Oil Development Co., New York, N. Y.
Standard Products Company, The, Cleveland, Ohio
Stauffer Chemical Company, New York, N. Y.
Stewart Die Casting, Chicago, Ill.
Sun Oil Company, Philadelphia, Pa.
Tennessee Eastman Corporation, Kingsport, Tenn.
Texas Company, The, New York, N. Y.
Toledo Steel Tube Co., The, Toledo, Ohio
Ultra Chemical Works, Inc., Paterson, N. J.
Union Carbide & Carbon Corp., New York, N. Y.
United Carr-Fastener Corp., Cambridge, Mass.
United States Rubber Company, New York, N. Y.
United States Testing Co., Inc., Hoboken, N. J.
Universal Match Corp., Ferguson, Missouri
Victor Chemical Works, Chicago, Ill.
Vulcan Copper & Supply Co., The, Cincinnati, Ohio
Wallace & Tiernan Products, Inc., Newark, N. J.
Washburn Co., The, Rockford, Ill.
Westvaco Chemical Division, New York, N. Y.
Witco Chemical Company, Chicago, Ill.
World Steel Products Corp., New York, N. Y.
Wyandotte Chemicals Corp., Wyandotte, Mich.
Zaremba Company, Buffalo, N. Y.
Zenith Plastics Company, Gardena, Calif.

BETTER WEAPONS

(Continued from page 32)

Europe, as well as in Asia: "Never mind what we do. Do as we say."

We are, in effect, doing just that when we arbitrarily cut appropriations for a defense force which has not yet been realized. Let me put it this way.

Suppose you, as an individual, made a down payment on something which your family agreed you needed. In this case, of course, it was an adequate national defense and the American family, represented by its Congress, agreed that it was needed and appropriated the money.

However, unlike a washing machine or a television set, this desirable item cannot be delivered until it is paid for.

If you will place yourself in the position of having paid 25% of the cost of a home appliance—and not received it—you may understand better what I am talking about.

The washing machine, still at the factory, washes no clothes, nor does the television set, still in the showroom, bring the wrestling matches into your living room.

This may be a homely sort of a simile to make, but a one-fourth built national defense establishment can never defend you and yours, or me and mine, or anybody else in this country.

When we asked the Congress for funds, we did not ask for a blank check. We filled in all the items on our budget, and every item was one that had been through the budget wringer at least three times. Arbitrarily to slash these funds places the Defense Establishment in the position of asking each to the other, "What part do you want, if you can only get a part?"

But, the overriding question is simply this:

Do you want adequate defense, and if so, when do you want it?

We cannot delude ourselves as to the security of the two oceans which used to be our natural barriers. Since time immemorial, they have been highways of commerce. They have also been avenues for invasion.

They are more so the latter today than ever before.

The Communist imperialism which plans the conquest of the world would like nothing better than to be able to cut apart the Free World to aggression, blockade, and ultimately conquest and enslavement.

Geologists will tell you that in terms of miles, the earth is just about the same size today as it was before the first sea animal ventured forth on land, millions of years ago; but science has caused the factors of time and distance to shrink, so that today we have all but run out of places to hide. Tomorrow there will be *no* place to hide.

The isolated republic, sooner than anyone thinks, can become a *former* republic.

If the forces of aggression decide to take up arms on a world-wide basis, and if the free world is not strong, it would be relatively easy for them to cut apart the free nations and consume them piecemeal.

As lovers of freedom, and as good Americans, we must not permit either of these aims to be accomplished.

The United States, in its history, has achieved the highest expressions of the ideal of freedom and democracy. In our pride, we should not forget we did not invent this ideal.

The men who founded our Republic and wrote our Constitution distilled it from the wisdom and philosophy of free men throughout the ages. The strength of this philosophy has allowed us to build our way of life and have enough left over to share with free men everywhere.

The desire and instinct for freedom and liberty is inherent in every human being. We wrote this philosophy into the Constitution when we dedicated ourselves to the proposition that all men are created equal.

The contemplation of a new world war is revolting to all of us. I have not met anyone, anywhere in this country, who sincerely believes that a third world war is preferable to our situation today.

We further plan ways and means to avert this war. But, what is more important, we implement these plans.

We must implement them, because we know we cannot be starryeyed in our idealism and fail to keep ourselves strong.

If this new war must come, it certainly will not be of our making. The time table, therefore, if there must be one for some new aggression, is not in our hands.

In my opinion, the next two years are crucial.

I believe that if the free world, led by the United States, will build substantial defenses, it will have a fair chance of avoiding this war.

We cannot avoid this war by putting off until tomorrow what we should do today.

It is already far later than we think.

COL. C. WELLAND CROWELL DIES

Col. C. Welland Crowell, vice-president of Rochester Germicide Company, Inc., and holder of the Army's Legion of Merit Medal for expanding chemical production in World War II, died June 1, 1952 in Genesee, N.Y. He joined the Germicide firm in 1919. He had served overseas with the Chemical Warfare Service.

He was recalled in 1940, as a major in the CWS. Three years later, he was appointed commanding officer of the Dallas, Texas, procurement service. He was discharged in 1945. In June, 1947, he was assigned to the 164th Composite Group, Army Organized Reserve in Rochester.

QUESTIONS AND ANSWERS

(Continued from page 29)

I may say, until we are well staffed, we are going to be very slow about issuing these certificates, because nothing would be worse than to get out a lot of certificates that would not stand up and don't represent the facts. The few we have issued so far have been extremely beneficial, and to expand this whole thing depends on our success and a capable staff for certification.

QUESTION: Has any consideration been given in the Navy program to protection of Navy personnel from gas, bacteriological and radiological attack?

ADMIRAL BOLSTER: The answer to that is, yes. I am not going into further details. It is natural that we give consideration to all kinds of attack—very serious consideration. protecting Naval personnel from various kinds of attack, is, of course, peculiar to whether you are in a ship or wherever you may be, but I think it is well written that the principles would be the same.

QUESTION: In the case of several prime contractors in different districts, to whom we are supplying the same part, we are experiencing a variance in the interpretation of inspection standards and procedures. What can be done to standardize procedures in all districts?

ADMIRAL BOLSTER: I don't believe that is a proper question to ask a man in charge of Research and Development. However, the Office of Material of the Navy is responsible for the material inspection service, and I believe it would be honest to say they are certainly trying to use the same standards throughout their procurement work.

I think it might be interesting to know, from the Research and Development point of view, that we have completely different kinds of people responsible for making a Research and Development contract, in the first place; and who are the liaison and inspection—if you want to call it inspection—I like to call it Contract Administration of the Research Results. In the case of our own program, the Office of Naval Research, we have field offices staffed with scientific personnel, rather than with the normal type of Naval material that would not be able to decide these matters.

I don't believe I can say anything more about the standardization. If this particular person wants to know more about this, I would be very glad to find out from the inspection officers of the Office of Material of the Navy for them.

BOOK REPORTS

INTRODUCTION TO ORGANIC CHEMISTRY. Alexander Lowy and Benjamin Harrow. Seventh revised edition by Benjamin Harrow and Percy M. Apfelbaum. John Wiley & Sons, Inc., New York, N. Y. 1951. 480 pages. $5.00.

More than a quarter of a century ago, Professors Lowy and Harrow set about to prepare an easily read text on organic chemistry for the beginning student; a text that would present the basic facts of the subject which could be covered in two semesters. They also wanted to tie organic chemistry to several of the other sciences such as medicine, dentistry, pharmacy, the biological sciences, agriculture, etc. The fact that this book has gone through six editions is a testimonial to their success. In this seventh edition extensive revisions have been made in aliphatic chemistry and in the material on polymers, in addition to bringing the whole subject up to date. Your reviewer has found the following features most useful: a four-page list of important organic radicals, several pages of structural formulas illustrating organic ring systems, and a list of Latin and Greek roots used in chemical technology.

BOOKS RECEIVED FOR REVIEW

Textbook of Organic Chemistry. George Holmes Richter. John Wiley & Sons, Inc., New York, N. Y. Third Edition. 1952. 762 pages. $6.75.

The Thermodynamics of the Steady State. K. G. Denbigh. Methuen & Co. Ltd., London, and John Wiley & Sons, Inc., New York, N. Y. Methuen Monograph Series. 1951. 103 pages. $1.75.

Selective Toxicity with Special Reference to Chemotherapy. Adrien Albert. Methuen & Co. Ltd., London, and John Wiley & Sons, Inc., New York, N. Y. Methuen Monograph Series. 1951. 228 pages. $1.75.

The Conduction of Electricity Through Gases. K. G. Emeléus. Methuen & Co. Ltd., London, and John Wiley & Sons, Inc., New York, N. Y. Methuen Monograph Series. 1951. 99 pages. $1.75.

Vinyl and Related Polymers. Their Preparations, Properties, and Applications in Rubbers, Plastics, Fibers, and in Medical and Industrial Arts. Calvin E. Schildknecht. John Wiley & Sons, Inc., New York, N. Y. 1952. 723 pages. $12.50.

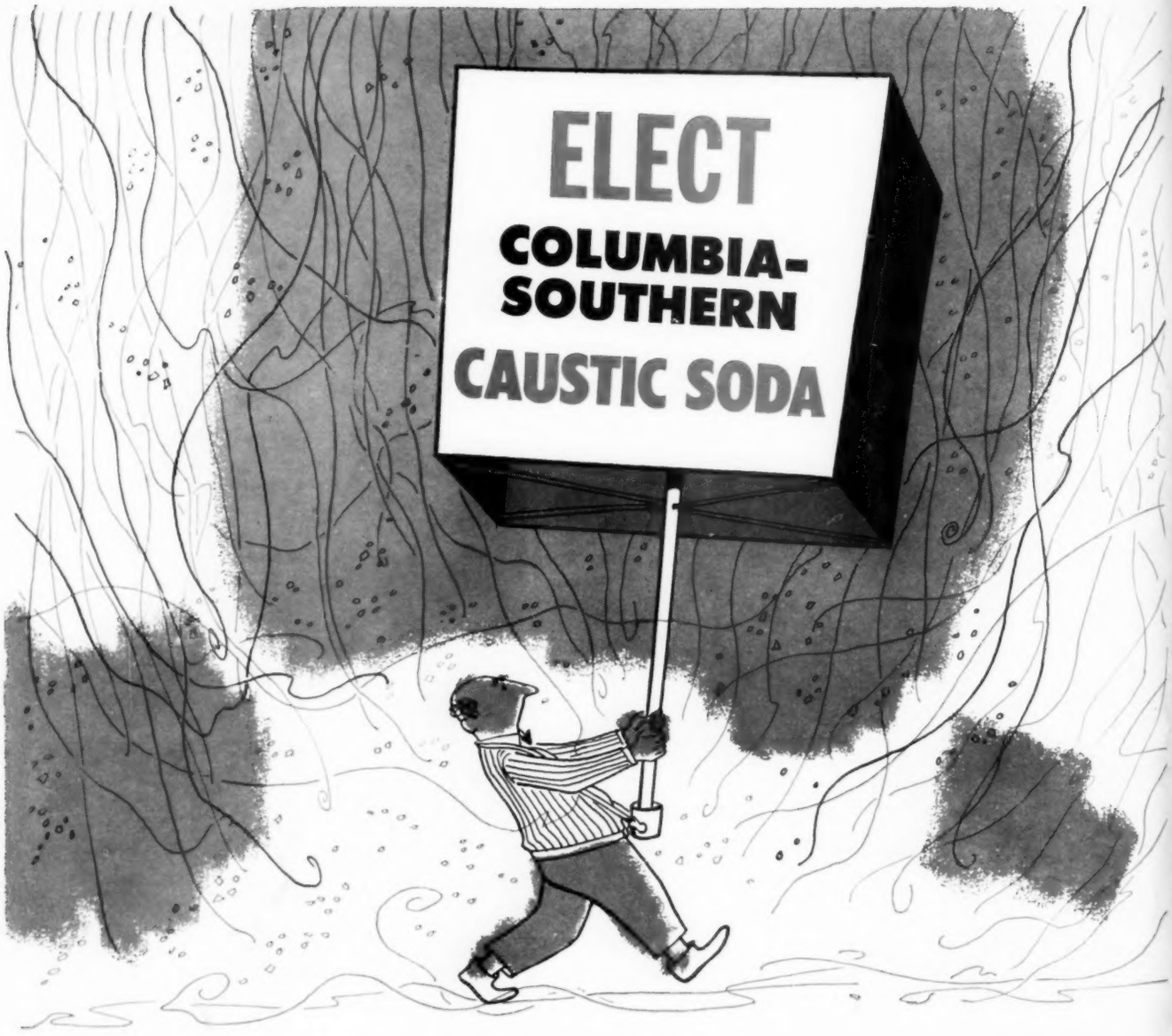
Chemical Calculations. An Introduction to the Use of Mathematics in Chemistry. Sidney W. Benson. John Wiley & Sons, Inc., New York, N. Y. 1952. 217 pages. $2.95.

Olin can help you hit your target

If you need help to hit your production target dates, let the practiced hand of Olin Industries serve you. Over 50 years of experience in conquering problems in metallurgy and explosives chemistry are yours to command. The Olin specialists can demonstrate to you how they tailor explosives and pyrotechnics to your individual demands. Western non-ferrous alloys and fabricated parts are Olin products famous for their quality . . . so are Winchester arms and Western and Winchester ammunition. Constant research has kept the many products of Olin leaders in their fields. So . . . what's *your* problem? If Olin doesn't have the answer already, they *know how* to get it for you. Call or write today.

FOR MORE INFORMATION, CALL OR WRITE... OLIN EXPLOSIVES DIVISION

OLIN INDUSTRIES, INC. EAST ALTON, ILLINOIS



Dependability, Quality, Service—these are the qualifications of a trustworthy candidate.

And these are the qualifications that you look for in your supplier of basic chemicals. For over half a century, Columbia-Southern has maintained a dependable history in quality and service in alkalies and related chemicals. Its production of Caustic Soda is of consistently high purity and shipments are made promptly to you from strategically located plants.

Elect Columbia-Southern as your dependable supplier of Caustic Soda.

COLUMBIA-SOUTHERN
CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

EXECUTIVE OFFICES: Fifth Avenue at Bellefield, Pittsburgh 13, Pennsylvania
DISTRICT OFFICES: Boston, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Houston, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco

Soda Ash • Liquid Chlorine • Sodium Bicarbonate • Calcium Chloride • Modified Sodas • Pittchlor • Caustic Potash • Chlorinated Benzenes • Rubber Pigments (Hi-Sil, Silene EF, Calcene TM) • Muriatic Acid • Perchlorethylene